Technical Manual

NAVY TYPE ACB

1600 FRAME SIZE

AIR CIRCUIT BREAKER

WESTINGHOUSE TYPE DBN-60S

2600 AMPERES – CONTINUOUS DIRECT-CURRENT

710 VOLTS - 2 POLES

(GENERATOR SERVICE)

WESTINGHOUSE ELECTRIC CORPORATION
Switchgear Department
EAST PITTSBURGH, PENNSYLVANIA, U.S.A.

Contract NObs-73085

Westinghouse Instruction Book 35-270-C18

INDEX

LIST OF ILLUSTRATIONS

NAVY TYPE ACB AIR CIRCUIT BREAKER
Westinghouse Type DBN-60S

GENERAL DESCRIPTION

IDENTIFICATION DATA

The circuit breaker described in this book is the generator breaker for the SS563-566 and 580. The identifying "Shop Orders" (which appear on the breaker nameplates) and the applicable "Certification Data" are as follows:

Certification Data Drawings		
SHOP ORDER	WESTING-HOUSE	BUSHIPS
†35-Y-2203	405-D-213	SS563-302-1617385
†35-Y-4501	405-D-213	SS563-302-1617385
†See Certification Data Sheet for Settings.		

GENERAL

The Type "DBN-60S" is a modified 1600-frame, Navy Type ACB air circuit breaker, as shown on Master Drawing 1-JH-220, BuShips Drawing. S6202-3,102,132 and as modified by applicable "Certification Data". (See Fig. 15.)

CONSTRUCTION (Figs. 1 and 2)

1. A typical breaker in an enclosure is shown in Figs. 1 and 2.

2. The breaker foundation structure consists of a rigid steel chassis to which are bolted the several subassemblies that make up the complete circuit breaker. The subassemblies are the operating mechanism, pole units, arc chutes, closing relay, closing magnet, anti-shock-open device, anti-shock-close device, series-overcurrent-trip devices, auxiliary switch, and shunt-trip device. These parts may be removed and replaced as complete assemblies.

OPERATION

1. The breaker may be operated manually or electrically. It is closed manually by depressing the latch in the operating handle on the front of the breaker and turning the handle 90 degrees in a clockwise direction. It may be tripped manually by turning the handle 45 degrees in the opposite direction with the latch held down.

2. Electrical operation is accomplished through use of the closing relay, the closing magnet, and the trip device. Turning the control switch on the control board to "CLOSE" operates the closing relay which closes the circuit of the closing magnet (solenoid) until the control switch is released. The breaker is tripped by turning the same switch to "OPEN". This operation causes the shunt-trip device to trip the breaker. Excessive currents cause the series-overcurrent device to trip the breaker automatically.

MOUNTING (Fig. 3)

Figure 3 shows the drilling plan to stud location. There are eight ½-inch mounting bolts which go through the switchboard and into tapped holes in the steel panel '150'.

CONTROL VOLTAGE

The closing magnet, the closing relay, and the undervoltage device with its resistor operate on a nominal voltage of 500 volts d-c.

CAUTION

The circuit breaker should be in the open position and the switchboard de-energized before installing, adjusting, inspecting, replacing parts, or removing the circuit breaker. If the bus cannot be de-energized, use insulated-handle tools, rubber gloves, and a rubber floor mat.

MAINTENANCE

a. Calibration. The overcurrent-trip device is calibrated at the factory to trip the circuit breaker at currents greater than the short-time-delay pick-up. The calibration point is marked on the scale plate. This calibration may be changed by turning the insulated knob on the overcurrent-trip device. Moving the indicator up decreases the pickup current, and moving it down increases the pickup current. Refer to Fig. 10 which shows the time vs. current characteristic of the overcurrent-trip device.

b. Inspection.

1. The frequency of inspection for maintenance will depend upon local conditions.

2. A complete inspection for preventive maintenance should be made at least once a year. It is recommended that a special inspection be given any breaker that has opened a heavy short-circuit current. If excessive heating is observed, look for loose or corroded contacts or connections. When inspecting the circuit breaker, examine the contact surfaces. Rough or high spots should be removed with a clean file or sandpaper. *Do Not Use Emery Cloth.*

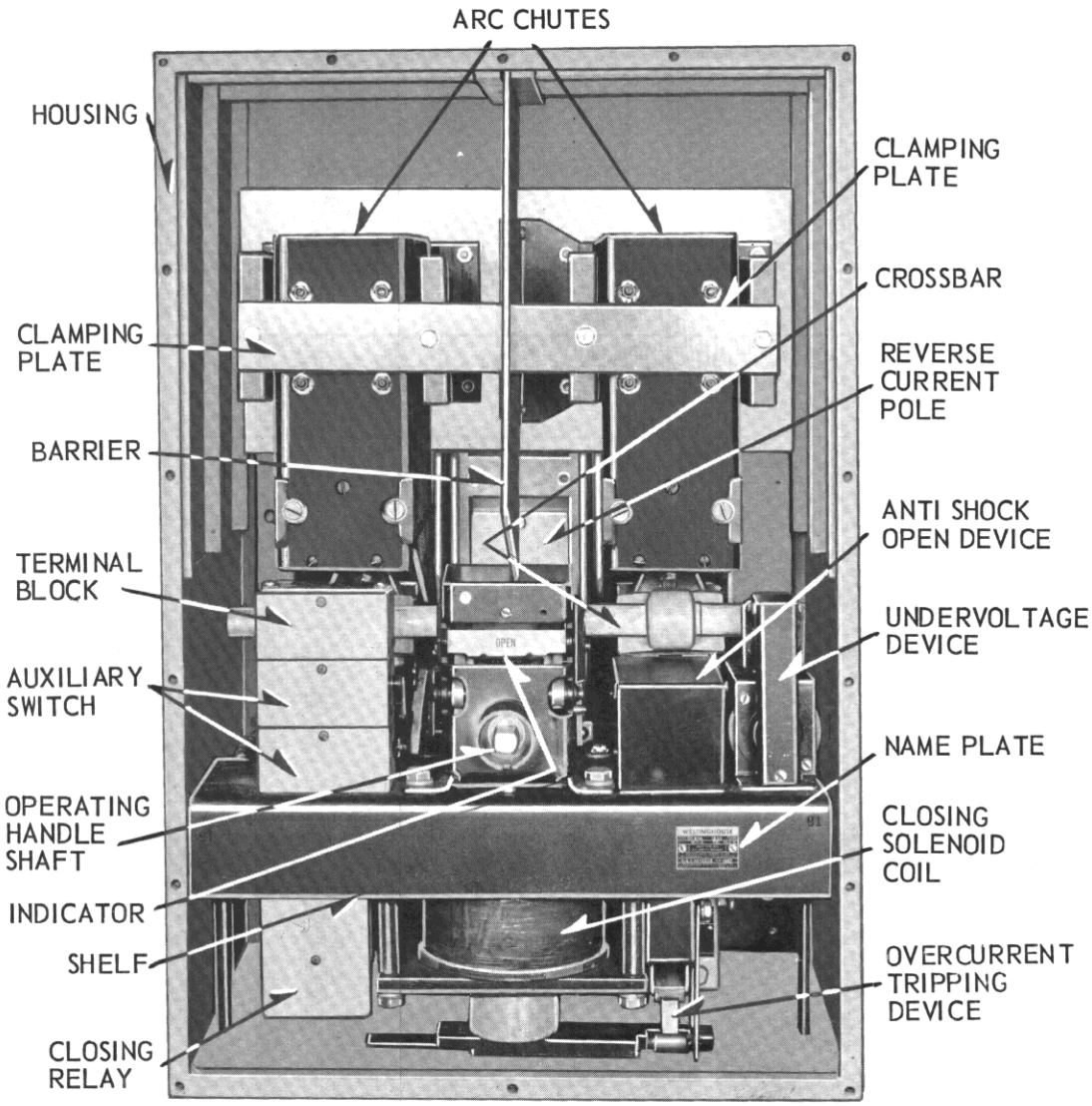


Fig. 1 — Front View of Circuit Breaker
(Photo 354996)

c. Lubrication. Bearing points in the mechanism may be oiled sparingly. Use a good grade of light machine oil and wipe off excess oil.

d. Disassembly (Fig. 3)

1. In order to make any inspections, repairs, or replacement of parts it will be necessary to open the switchboard door. To do this, proceed as follows:

(a) Open the breaker.

(b) Remove the handle '166' by removing the set screw. (See Fig. 6)

(c) Open the switchboard door. Certain repairs and replacements can now be made without further disassembly. To inspect contacts, remove arc chutes '135', Fig. 3. To work on parts of the breaker still inaccessible, it will be necessary to remove the bracket-and-shelf assembly '151' and '152' as follows:

(d) Remove ship's wiring from the terminal block '169'.

(e) Remove the arc chutes '135'.

(f) Remove the locking rings from each end of the crossbar '168'.

(g) Disengage the insulating links by sliding the crossbar first to one side, then to the other.

(h) Remove the four hex-head bolts (using an extension socket wrench) that hold the shelf brackets '151' to the panel '150'. This frees the bracket-and-shelf assembly '151' and '152' from the steel panel '150'. The whole assembly should be lifted slightly and pulled forward.

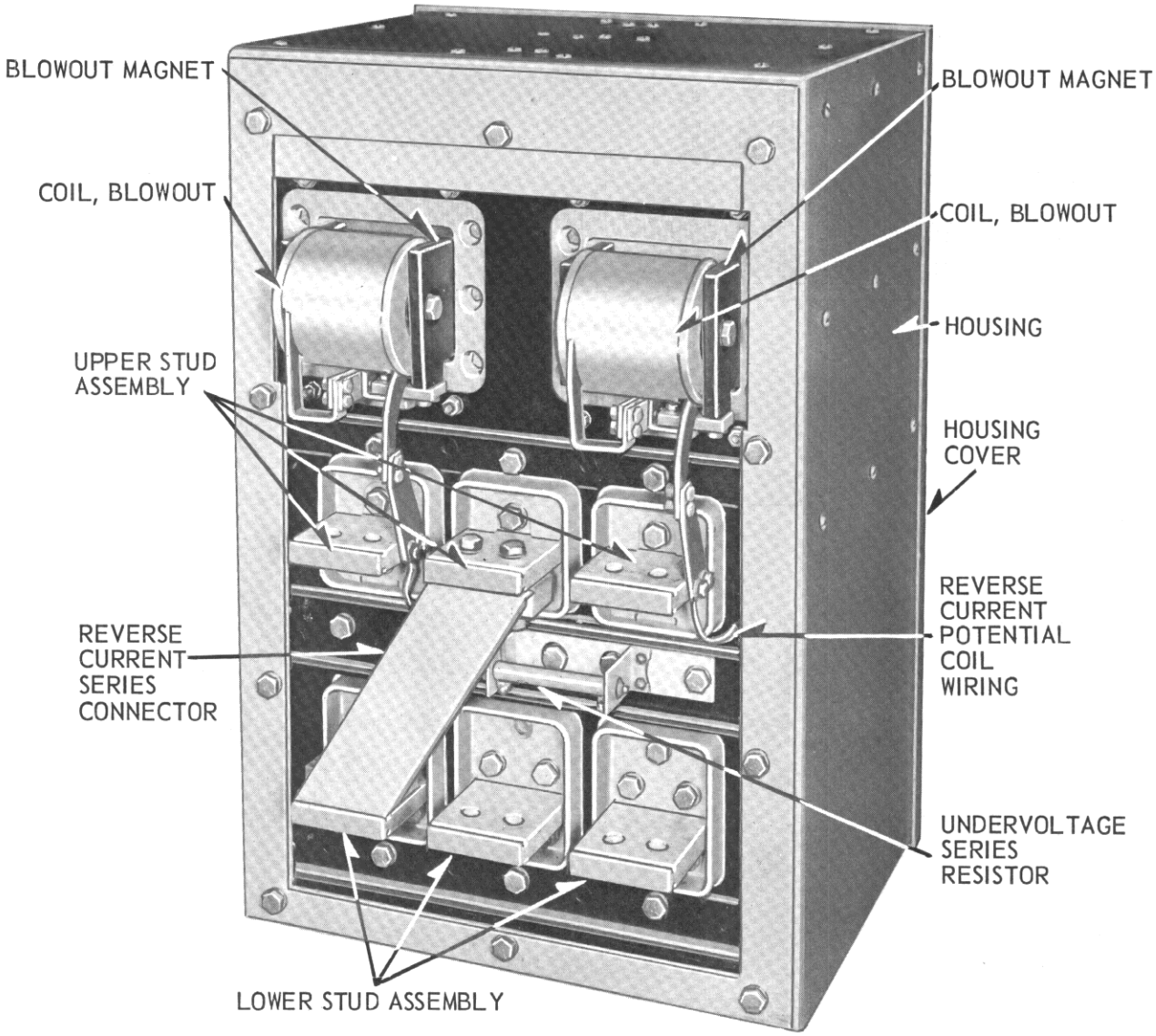


FIG. 2 — Rear View of Circuit Breaker (Photo 354995)

2. The breaker is now disassembled sufficiently for most replacements or repairs. The overcurrent-trip units may be removed by removing four hex-head bolts at the lower stud on the back of the breaker. Two of the bolts are above and two are below the lower stud.

e. Assembly. The breaker is reassembled in the reverse order.

CAUTION

Trip-finger screws '243', must be above the tops of the overcurrent-trips '400', when the bracket-and-shelf assembly is put into the housing, or the trip finger will be broken. (See Figs. 3 and 6.)

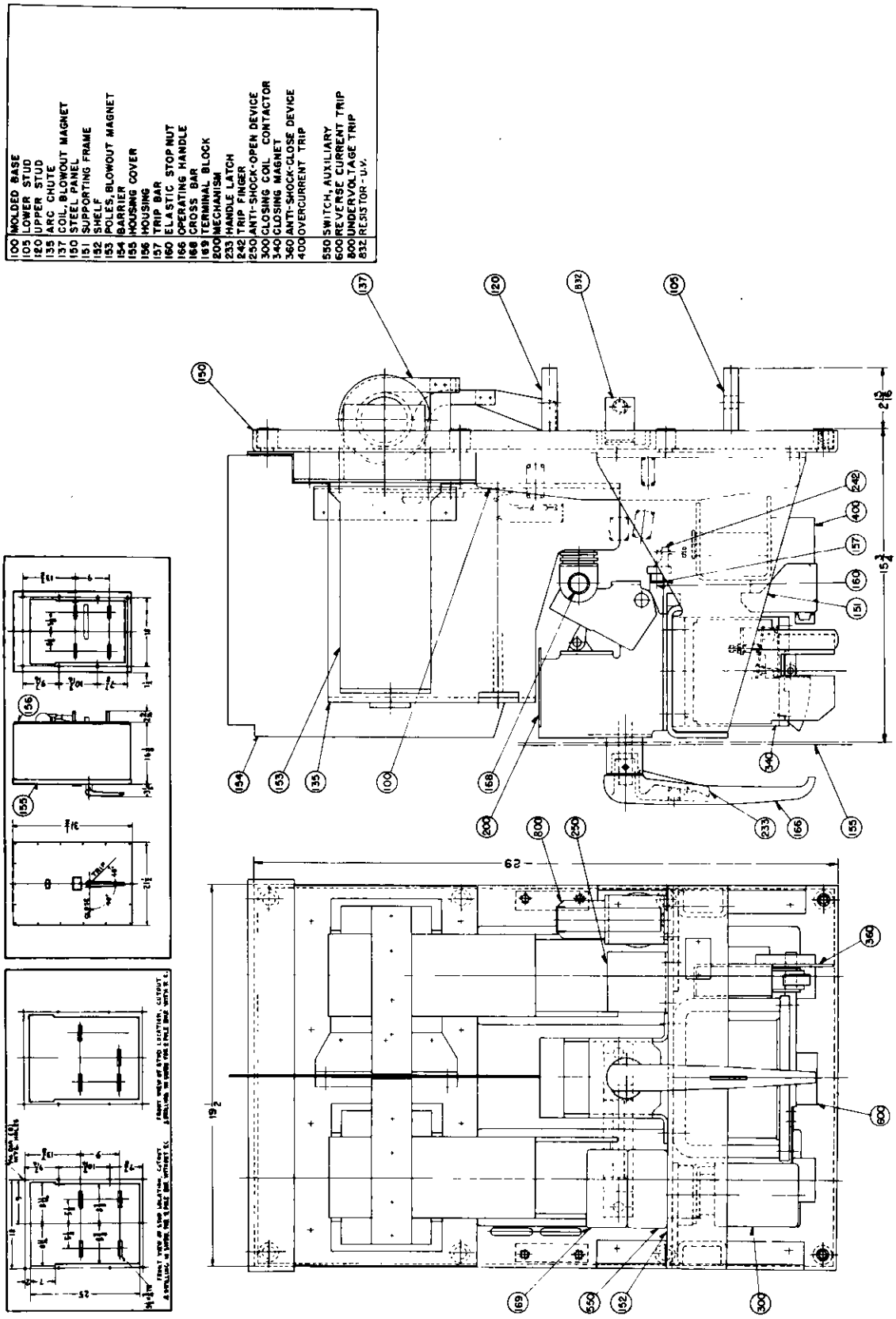


FIG. 3 — Air Circuit Breaker—General Assembly
(Dwg. 445D378)

COMPONENTS AND ATTACHMENTS

ARC CHUTES (Fig. 4)

a. Function. Each pole unit has one arc chute '135'. The chute, mounted so that it surrounds and extends over the contact assembly of the pole, stretches and cools the arc drawn by the separating contacts. When the arc is drawn, it moves up into the chute by magnetic and thermal action, where it is quickly de-ionized and extinguished, thus opening the circuit in the least possible time. The arc chutes are an extremely important part of the circuit breaker. The breaker should never be energized without the arc chutes being mounted in place.

b. Description. Each arc chute consists of a number of asbestos plates supported in a laminated case and held in place on the molded base '100', by a clamping plate '136', and insulating spacers '146'.

CONTACT ASSEMBLY (Fig. 4)

a. Function

1. The contact assembly closes and opens the electrical circuit through the circuit breaker. The upper stud '120', the stationary contact '121', the series-overcurrent-trip device '400', and the lower stud '105', are stationary and are mounted on the molded base '100'. The moving contact assembly is hinged on the molded base by a pin '127', and is moved in and out by a molded insulating link '116', which is pivoted on the crossbar '168', Fig. 3.

2. The moving contact assembly is closed, and held in the closed position against the force of the accelerating springs '131' by a molded insulating link '116'. When the breaker is tripped, and the force exerted by the molded insulating link is released, the accelerating springs '131' quickly force the moving contact assembly to the open position.

3. When the breaker interrupts high, short-circuit currents, magnetic forces play a large part in the rapid opening of the contacts. The moving contact assembly moves from the stationary contacts, separating the main contacts '109' and '121' first. As the arcing contacts open under load, an arc is drawn. The end of this arc on the stationary arcing contact then moves up to the blowout-magnet contact '144', putting the blowout-magnet coil '137' in series with the arc. Flux from the blowout magnet forces the arc up into the arc chute where it is extinguished. As the circuit breaker closes, first the arcing contact surfaces touch, and then the main contacts touch.

b. Description

1. The stationary contact assembly consists of the main contact, extruded integral with the upper stud '120', and the arcing contact '123'. The stationary arcing contact surfaces of the stud '121' and the contact '123', are special arc-resisting silver-alloy inserts.

2. The moving contact assembly consists of a contact arm '175', which is pivoted to the pole unit by a pin '127', and carries the main moving contact '109', and the moving arcing contact '118'. The moving contact assembly is attached to the mechanism crossbar '168', Fig. 3, by a molded insulating link '116', which is screwed on to a metal link '111', and locked by a nut '114'. When the breaker is tripped, all force is removed from the crossbar, and the accelerating springs '131', quickly force the moving contact assembly from the closed to the open position.

3. The auxiliary contact '176', serves as a connector from the main moving contact to the upper terminal of the series coil of the over-current tripping device.

c. Replacements (Fig. 4)

1. To replace the stationary arcing contact '123' or the spring '184':

(a) Remove the arc chute '135' by removing the screws '147'.

(b) Remove the two bolts holding the contact assembly and replace either it or the spring as required.

2. To replace the moving arcing contact '118':

(a) Remove the arc chute '135', by removing the screws '147'.

(b) Remove the bolts '112', which will free the contact for replacement.

3. To replace the blowout-magnet contact '144':

(a) Remove the arc chute '135', by removing the screws '147'.

(b) Remove the two screws through the back of the arc chute which secure the contact. Replace the contact.

4. To replace the main contact spring '182':

(a) Remove the arc chute '135', by removing the screws '147'.

(b) Release the spring in the contact arm '175', by rotating the locking clip in the spring seat with a screwdriver or with the fingers.

5. To replace the accelerating spring '131':

(a) Remove the arc chute '135', by removing the screws '147'.

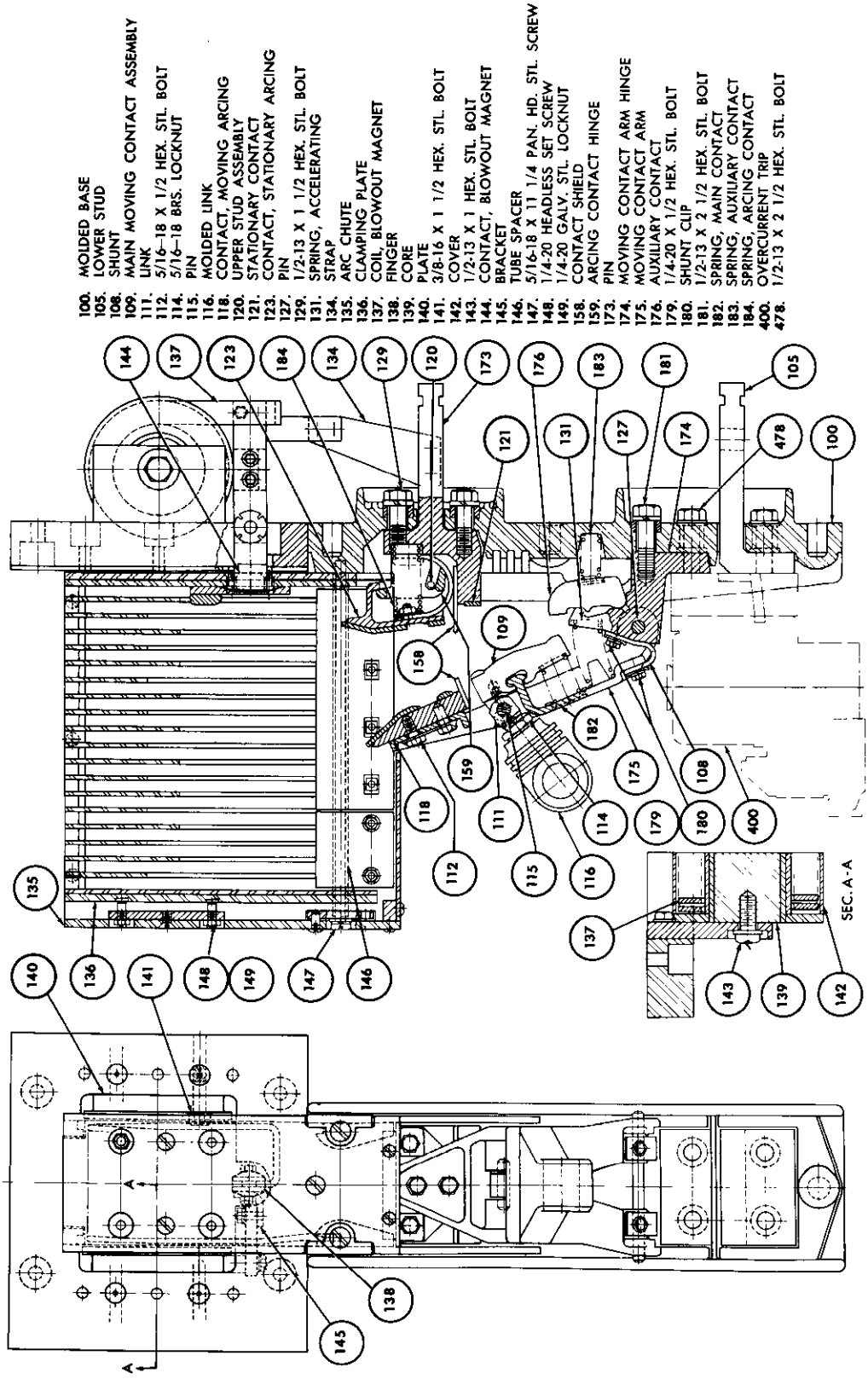


Fig. 4 — Air Circuit Breaker Pole Unit
(Dwg. TP-55-485)

(b) Work the springs out of their sockets with a screwdriver.

6. To replace the auxiliary contact springs '183':

(a) Remove the arc chute '135', by removing the screws '147'.

(b) Work the springs out with a screwdriver and replace.

(c) If difficulty is experienced, loosen the moving contact arm hinge loosening the bolts in vicinity of the lower stud holding the overcurrent trip and contact arm hinge.

OPERATING MECHANISM (Figs. 5 and 6)

a. Function

1. The operating mechanism opens and closes the circuit-breaker contacts by moving the crossbar '168', Fig. 3, to which the moving contact assemblies are attached by insulating links. The breaker is closed manually by turning the operating handle quickly and smoothly as far as it will go 90 degrees in a clockwise direction. The breaker may be tripped manually by turning the handle 45 degrees in a counter-clockwise direction. Handle latch '233', must be held in while closing or tripping. The breaker is tripped automatically by one of the automatic devices described later which rotate trip lever '220', about pin '224'.

2. The mechanism is "trip free", that is, it is not possible to close the breaker if one of the automatic tripping devices moves the trip bar up during the closing stroke or if the trip bar '157', Fig. 3, is held in the raised position.

b. Description

1. The operating mechanism consists of a group of toggle links, and a latch attached to the operating mechanism frame on fixed pins '214', '226', '241', '216', '224' and '245'. The crossbar '168', is held by the closing lever '207'. Rotating the operating handle clockwise moves the mechanism linkage from the open position shown in Fig. 6 to the closed position shown. This is accomplished when the roller '236', located off-center on the end of the operating handle shaft '232', forces the first toggle link '203' upward, pushing second toggle link '204', third toggle link '206', and closing lever '207', ahead of it. The motion of the toggle linkages is directed by link '205', which is pivoted at its lower end on pin '217', in latch '208'. Latch '208' in turn, is restrained from moving by roller latch '210', which is pivoted on pin '214', and engages trigger '221' on trip lever '220'. The linkage is held in the closed position by pawl '209', which latches under pin '227'. The handle shaft and lever are returned to the normal position after closing by gravity.

2. The mechanism is opened by rotating trip lever '220' counter-clockwise. This is accomplished either by rotating handle counter-clockwise, in which case roller '236' on the end of handle shaft lever, strikes the extreme left end of trip lever '220' to move it downward; or by causing tripping attachments to strike trip-finger screw '243', or trip bar '157', Fig. 3. In either case the counter-clockwise rotation of the trip lever '220', moves trigger '221' out of engagement with the lower end of the roller latch '210', which in turn permits the roller latch to rotate counter-clockwise out of engagement with latch '208'. Latch '208' is then free to rotate in response to the pull of the latch link '205', so that the mechanism assumes the trip-free position shown in Fig. 6 in which contacts are open but part of the mechanism levers are in the closed position. In this position, pawl '209' is disengaged from pin '227' by a lug on link '204' which pushes it up permitting the linkage to collapse to the open position shown in Fig. 6.

3. Gravity returns the operating handle to the normal vertical position after manual tripping.

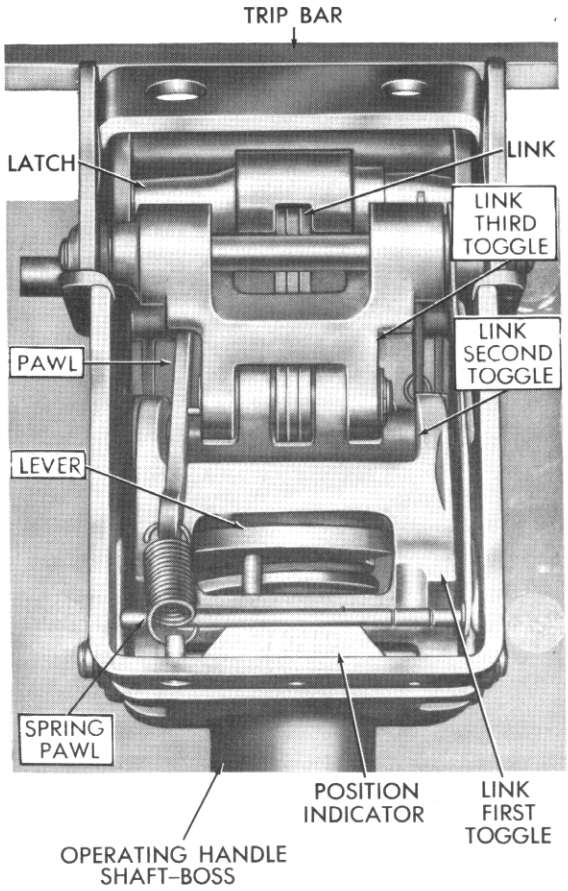


Fig. 5 — Top View of Breaker Operating Mechanism (Photo TP-55-486)

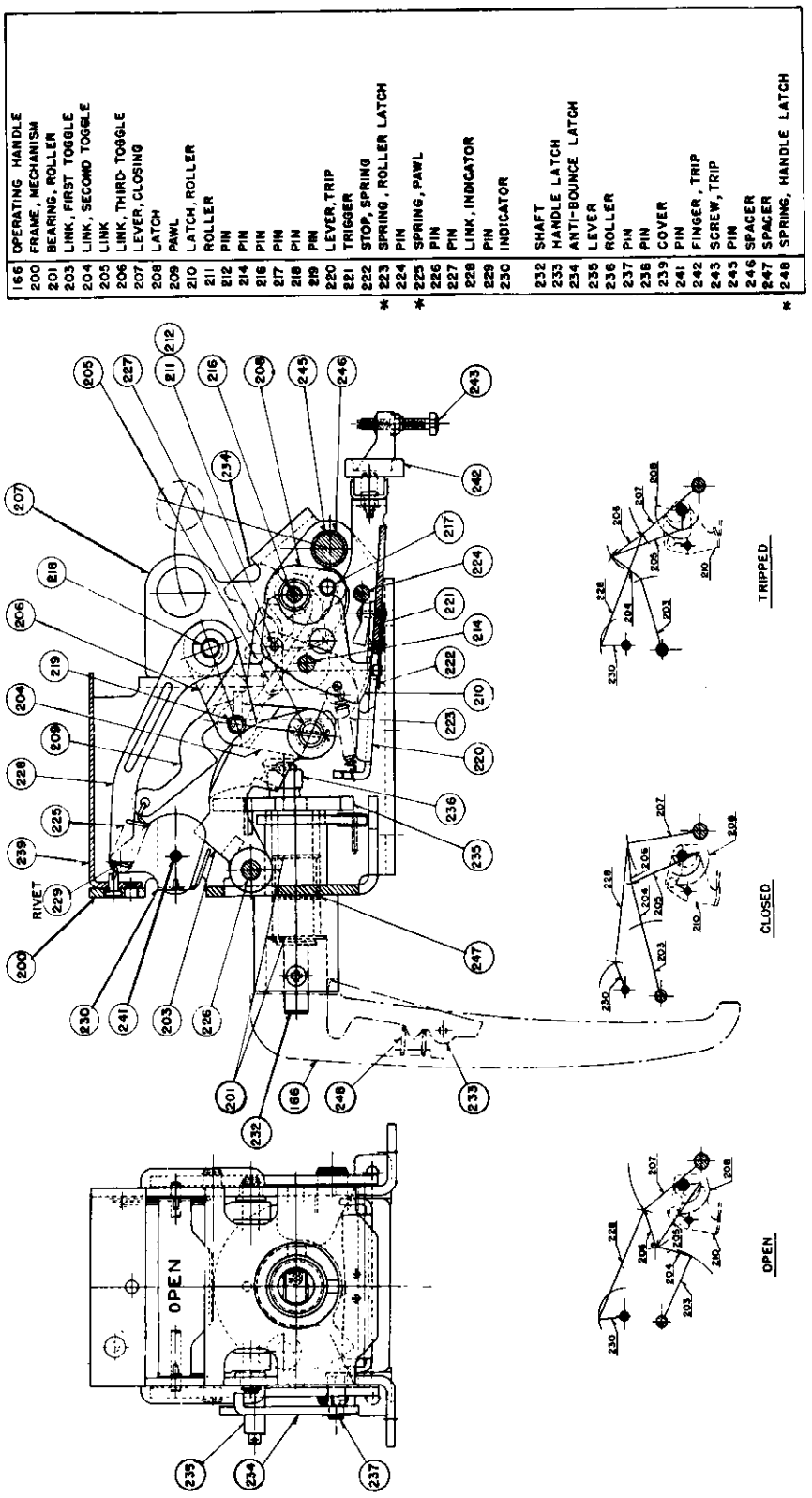


Fig. 6 — Breaker Operating Mechanism Assembly
(Dwg. TP-56-191)

c. Anti-Bounce Latch. The anti-bounce latch '234', prevents the breaker from bouncing closed when interrupting short-circuit current. As the breaker opens, pin '238' strikes latch '234', pivoted on pin '237', rotating the latch until its hook is in position to hold pin '238' from bouncing to the closed position.

d. Position Indicator. The position indicator '230', is formed from sheet metal and is pivoted on pin '241'. It is visible from the front of the circuit breaker through a window in the housing and mechanism frame. See Fig. 3. With the circuit breaker in the open position shown in Fig. 6, the amber face of the indicator shows through the window. The word "OPEN" is stamped on this amber face. When the breaker closes, pin '218' of the closing lever '207', pulls indicator link '228' to the right, thus rotating the other face of the indicator up into a position visible through the window. This face is painted blue and is stamped with the word "CLOSED".

e. Replacements

1. To replace roller latch spring '223':

(a) Disconnect auxiliary switch links.

(b) Rotate handle '166' clockwise until pin '227' is visible through right side of the mechanism frame. Using a small rod as a pusher, shove this pin part way through the hole until the operating rod of the closing magnet drops off. Return pin '227' to its proper location and allow the linkages to fall open. This frees the mechanism from the closing magnet.

(c) Remove crossbar '168', Fig. 3. Remove the four bolts which hold mechanism to the shelf '152', Fig. 3. This frees mechanism from shelf but frees also the closing magnet. This should be either replaced or blocked in place during repairs to the mechanism.

(d) Removal of pin '224' allows trip lever '220' to be removed, and spring '223' may then be replaced.

2. To replace handle stop spring '248';

(a) Remove handle '166', handle latch '233' and replace spring '248'.

3. To replace pawl spring '225':

(a) This spring may be replaced without further ado after removing mechanism cover '239'.

ANTI-SHOCK-CLOSE DEVICE (Fig. 7)

a. Function. This device serves to prevent the circuit-breaker contacts from closing from shock when open. This is accomplished by an arrangement whereby a mechanical escapement device or "ticker" is operated by the closing of the breaker. Shock blows tending to close the breaker are of such short duration that the mechanical escapement device does not have time to operate, thereby effectively locking the circuit breaker in the open position. This mechanical escapement device is, however, easily overcome when the circuit breaker is operated normally.

b. Description

1. The anti-shock-close device consists of a ticker case '360', Fig. 7, which contains the ticker assembly, bolted to the closing magnet. An arm '384', is bolted to the moving core '342' of the closing magnet, and when the moving core moves up, a cam '361' is caused to rotate in a clockwise direction around a pin '370', against the torsion of the reset spring '369'. As the cam rotates in this manner, an oscillator wheel '362' is caused to rotate clockwise around a pin '372', by pin '368' mounted in the cam '361'. The rotation of the wheel '362', is regulated by a mechanical oscillator '364', which is pivoted on a pin '365', and caused to oscillate due to the engagement of its teeth by the oscillator wheel '362'.

2. When the circuit breaker is tripped, operating rod '343' drops unimpeded, and a reset spring '369', returns the cam '361' to the breaker "OPEN" position shown in Fig. 7. Shock blows tending to close the circuit breaker would have to act in such a way as to raise the operating rod '343'. These blows are of such short duration that the cam is restrained long enough by the oscillator wheel and the oscillator to prevent closure of the circuit breaker.

c. Replacements

1. To replace the reset spring '369':

(a) Remove device from the closing magnet yoke '340', by removing the bolts '374'.

(b) Remove the "Truarc" rings '367, 371, and 373' which will allow the corresponding pins to be removed. The various parts are then free to be removed, and the spring may be replaced.

(c) After reassembling, be sure that the cam operates freely and returns easily to its starting position.

CLOSING MAGNET OF SOLENOID (Fig. 7)

a. Function. The closing magnet is the device used to close the circuit breaker electrically from the control board. Mounted directly below the operating mechanism and under the shelf of the circuit breaker, it is secured to the shelf with the same four bolts that hold the operating mechanism in place.

b. Description

1. The closing magnet consists of an iron frame or yoke '340', which is securely bolted to the circuit breaker shelf by four bolts '349', a plunger or

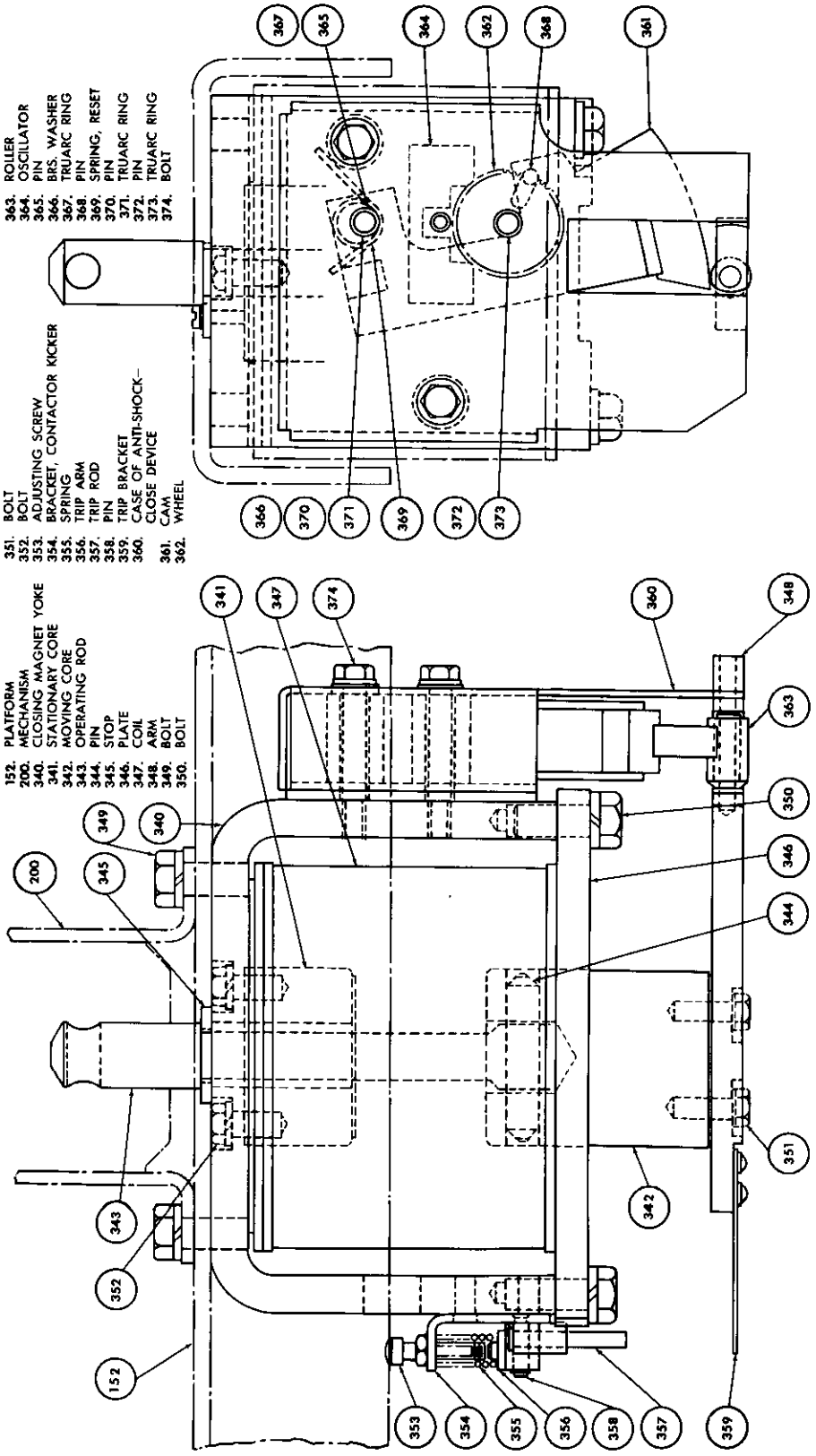


Fig. 7 — Breaker Closing Magnet
(Dwg. TP-55-488)

moving core '342', an operating rod '343', a stationary core '341', and a coil '347'. The operating rod '343', connects the moving core '342', to a pin '227', Fig. 6, on the operating mechanism. It will be observed in Fig. 6 that an upward movement of this pin will cause the mechanism to close and latch the circuit breaker. When the coil '347' of the closing magnet is energized by the relay '300', Fig. 3, the moving core '342' moves upward in response to the magnetic attraction between stationary and moving cores, across an air gap. About one-tenth of a second is required for the closing magnet to close and latch the circuit breaker.

2. When the moving core moves into the breaker "CLOSED" position, the trip bracket '359' trips the relay mechanically, thus opening its contacts and de-energizing the closing magnet. The trip bracket '359' in moving up, lifts the trip rod '357', which rotates the trip arm '356' against the force of a spring '355'. This rotation of the trip arm '356', engages the trip finger '327', Fig. 8, of the closing relay and trips the relay.

3. The closing coil '347', is momentarily-rated and serious damage will result if potential is allowed to remain on its terminals through improper adjustment of the trip finger '327', Fig. 8, of the closing relay. When the moving core and operating arm have pushed the mechanism linkages to the closed and latched position, a pin '227', Fig. 6, holds the moving core in the closed-gap position. When the mechanism is tripped, this pin '227', Fig. 6 falls, allowing the operating arm and the moving core to fall with it.

c. Replacements

1. To replace the closing coil '347':

(a) Remove the arm '348' by removing bolts '351'.

(b) Remove the plate '346' by removing four bolts '350'.

(c) Remove the coil leads and replace coil.

2. To replace the spring '355':

(a) Remove the closing relay '300', Fig. 3, as described in the paragraph following.

(b) Remove the snap ring from pin '358' and slide the relay trip arm '356' off.

CLOSING RELAY (Fig. 8)

a. Function

The closing relay is mounted on the underside of the breaker shelf to the left of the closing magnet. The relay has the function of closing and opening the closing-coil circuit in electrical operation. Together with the shunt trip, the closing relay enables the operator to have remote control of the circuit breaker electrically by means of a control switch, from the control board.

b. Description

1. The relay base '300', is molded from insulating material. The contact assemblies, coil assembly, and other parts are attached to this base. The frame '305', serves as part of the magnetic circuit of the coil '338', and also serves to hold the coil in place. This frame or yoke is fastened to the molded base by three screws '318'. The coil '338' is wound on a molded spool '339', and is held in place by a guide tube '337' which extends from the top of the molded base through the bottom of the frame '305', and through the center of the spool. At its upper end, the guide tube '337' holds the stationary core '306' firmly in place against the frame. The moving core '333' is free to slide up and down in the guide tube '337'.

2. When moving up, in response to the magnetic pull between the stationary and moving cores, when the coil is energized, it pulls the latch '336' fastened to a pin '335', up with it. When the coil '338' is energized, a spring '334', bearing against the latch '336', holds this latch in such a position that it is hooked under a latch pin '316'. This causes the moving contact-arm assembly '301', to rotate counter-clockwise around the contact-arm pin '329', thereby compressing a spring '312'. The moving contacts '303', are thus pulled against the stationary contacts '304', completing the circuit. In Fig. 8, the moving core is shown in the upper "contacts closed" position.

3. As soon as the contacts close, current starts flowing through the closing coil of the circuit breaker. The moving core '342', Fig. 7, of the closing magnet moves up, closing the circuit breaker. The trip bracket '359', moves up with the moving core of the closing magnet and engages a trip rod '357'. The trip rod rotates the relay trip arm '356', around a pin '358', against the force exerted by the spring '355'. The relay kicker in rotating, engages the relay trip finger '327', Fig. 8, to lift it and trip the relay as described below. The trip finger '327', is fastened to a release bracket '308', and rotates it counter-clockwise around a pin '317', against the torque exerted by the torsion spring '313'. When the release bracket '308', is rotated in this manner, it strikes the bottom of a latch '336', rotating it counter-clockwise around a pin '335', against the force of the spring '334'. This rotation of the latch '336', causes it to become disengaged from the latch pin '316'. Consequently the spring '312' extends, causing the moving contact assembly '301', to rotate clockwise, snap the moving contacts '303', away from the stationary contacts '304', and interrupt the circuits.

4. With the circuit breaker in the closed position the relay trip arm '356', Fig. 7, of the closing magnet holds the trip finger '327', Fig. 8 of the relay in the trip position. Therefore, even though

the relay coil may be inadvertently energized when the circuit breaker is latched, the relay contacts will not close, and current will not flow through the circuit-breaker closing coil. The moving contacts, '303', Fig. 8, are resilient-mounted by means of springs, '314', around studs set into the moving contact arm '301', and are secured by elastic stop nuts '315'. This causes a slight rolling and wiping action on the spherically-shaped contact surfaces as they meet, which helps to insure a positive electrical connection.

5. An arc chamber '310', molded from arc-resisting material, surrounds the left-hand contacts. It is held in place by means of the two iron plates of the blowout-magnet assembly '302', which in turn is fastened to the molded base '300', by means of a screw '323'. The blowout-magnet coil is connected in series with the left-hand contacts, so that flux is flowing through the magnetic circuit, and the air-gap of the blowout-magnet assembly, at the time the contacts part and draw an arc. The magnetic circuit is so arranged that its air-gap is across the arc chamber and the arc. The arc is forced by magnetic action down into the arc chamber, where it is extinguished due to the stretching and cooling process.

NOTE: The right-hand contacts are not used.

DANGER

Before working on the relay, make sure that the circuit breaker is open and that the upper and lower studs are dead. Be sure that the control circuits are dead. Remember that control wiring may be "hot" even though the main circuit breaker studs are dead.

c. Replacements

1. Before replacing parts of the relay, it is best to disconnect the wiring and remove the relay from the circuit breaker as follows:

(a) Remove screw '322', Fig. 8, and lift off the molded cover '309' of the relay thus exposing the four numbered terminals.

(b) Remove and tag the wires from the four terminals by loosening the four screws '320'. Remove the front cover of the auxiliary switch and disconnect the relay coil lead.

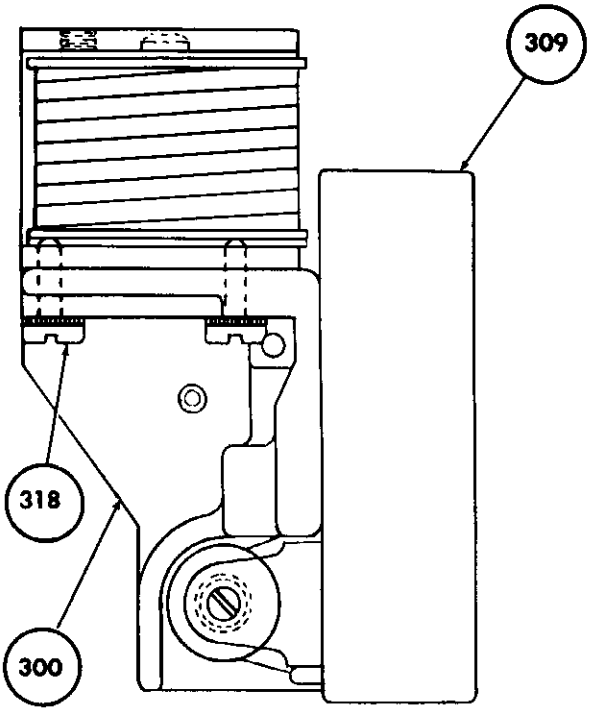
(c) Remove the two screws through the circuit-breaker shelf '152', Fig. 3, which hold the relay to the shelf. The relay can now be removed.

2. To replace the relay coil:

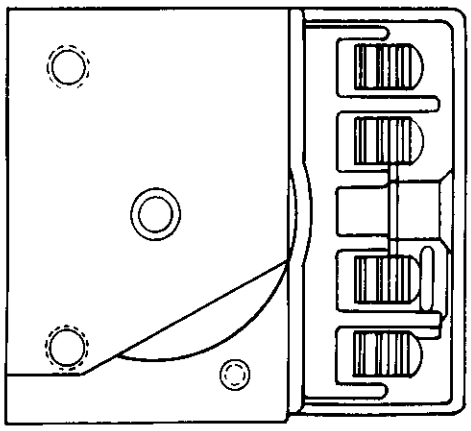
(a) Remove the three screws holding the coil frame '305', Fig. 8, to the molded base '300' and remove from base.

(b) Pull out the guide tube '337' allowing the stationary core '306' to drop out.

(c) Replace coil.



LEFT SIDE VIEW



TOP VIEW

3. To replace the latch spring '334':

(a) Remove the three screws holding the coil frame '305', to the base '300'.

(b) Pull out the guide tube '377' and stationary core '306'.

(c) Litt out the moving core assembly '333'.

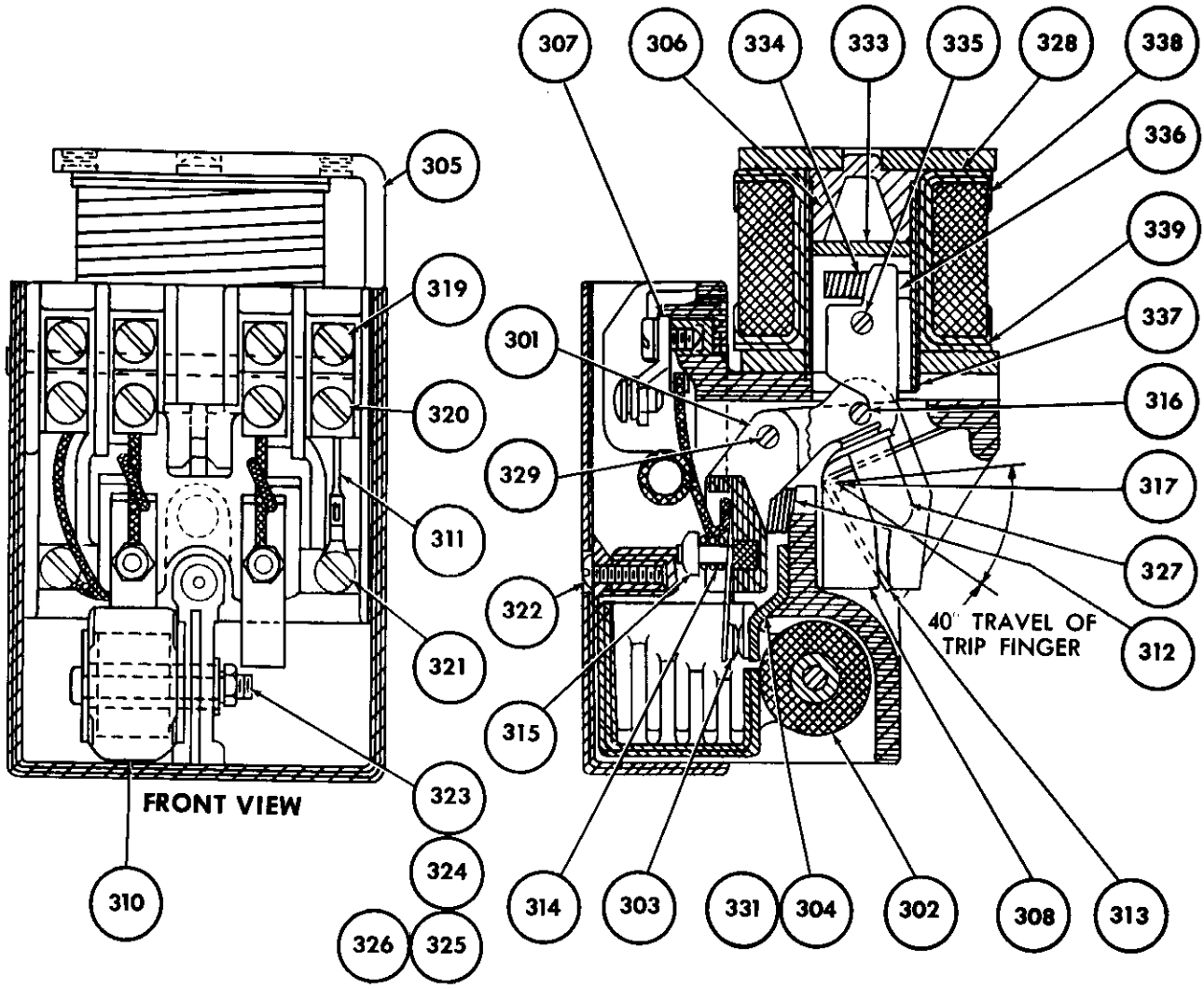
(d) Rotate the latch '336' clockwise, as far as it will go.

(e) A spring '334' will drop out. Be sure it is replaced.

4. To replace the trip spring '313':

(a) Remove the snap ring from one end of the release bracket pin '317' and push the pin out.

(b) Replace the pin and a new spring.



300. RELAY BASE
301. MOVING CONT. ARM ASSY.
302. BLOWOUT MAGNET ASSY.
303. MOVING CONT. ASSY.
304. STAT. CONT. ASSY. R.H.
305. FRAME
306. STAT. CORE
307. TERMINAL BRACKET
308. RELEASE BRACKET
309. COVER
310. ARC CHAMBER
311. TERM. CONN.
312. SPRING, CONTACT
313. SPRING, TRIP
314. SPRING, CONTACT ARM
315. ELASTIC STOP NUT
316. LATCH PIN
317. RELEASE BRKT PIN
318. 1/4-20 X 5/8 SCREW
319. .190-32 X 3/8 SCREW
320. .190 X 1/4 BINDING HD. SCR.
321. .164-32 X 3/8 PAN HD. SCR.
322. .164-32 X 3/4 PAN HD. SCR.
323. .190-32 X 1 3/8 PAN HD. SCR.
324. .190 STD. WASHER
325. .190 STD. LOCKWASHER
326. .190-32 NUT
327. FINGER, TRIP
328. SPRING WASHER
329. CONTACT ARM PIN
331. STAT. CONT. ASSY. L.H.
333. MOVING CORE
334. SPRING, LATCH
335. PIN
336. LATCH
337. GUIDE TUBE
338. OPERATING COIL
339. MOLDED SPOOL

FIG. 8 — Breaker Closing Relay
(Dwg. TP-55-489)

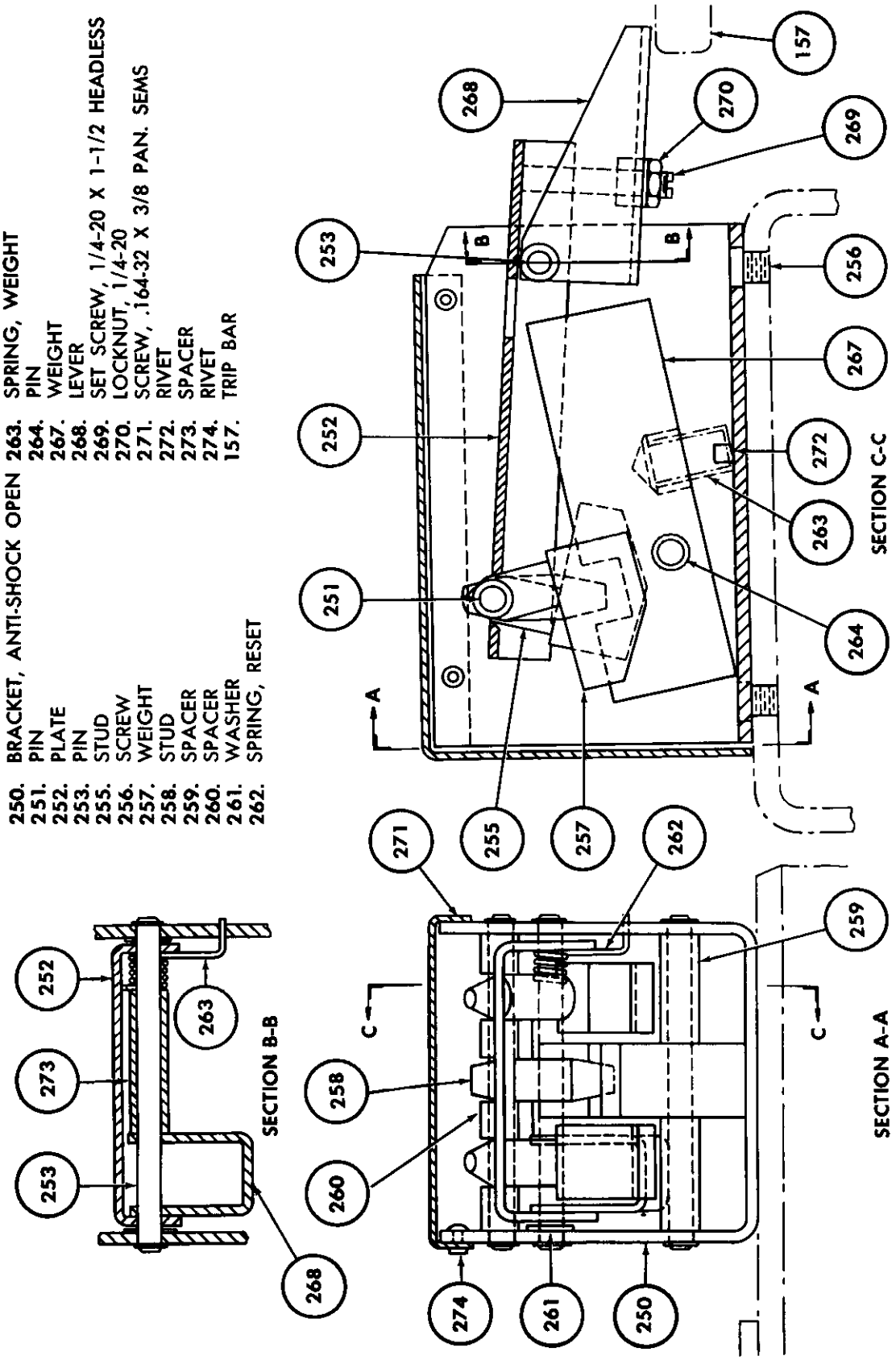


Fig. 9 — Anti-Shock-Open Device
(Dwg. TP-55-490)

5. To replace the moving contact-arm spring '312':

(a) Remove the snap ring from one end of the contact-arm pin '329' and push pin out.

(b) Remove the moving contact-arm assembly '301' and replace the spring '312'.

6. To replace the moving contact '303', or contact spring '314':

(a) Remove the elastic stop nut '315', and replace the spring (if necessary).

(b) If a moving contact is to be replaced, disconnect its lead from under the applicable terminal screw '319'. Remove and replace it.

7. To replace the blowout-magnet assembly:

(a) Disconnect leads of the blowout coil.

(b) Remove the screw '323', and replace the blowout-magnet assembly.

8. To replace the stationary contact assembly:

(a) If left-hand contact is to be removed, it will be necessary to remove the blowout-magnet assembly as outlined above.

(b) Remove the applicable screw '321' and replace the contact.

ANTI-SHOCK-OPEN DEVICE (Fig. 9)

a. Function. The anti-shock-open device prevents tripping of the circuit breaker from rotation of the trip lever caused by shock, but allows rotation of the trip lever by tripping devices.

b. Description

1. The bracket '250', Fig. 9, is mounted on the breaker shelf to the immediate right of the operating mechanism frame '200', Fig. 3, and is held to the shelf by two screws '256', Fig. 9. The plate '252', is pivoted on a pin '253', as is the lever '268'. The lever and plate are connected by a setscrew '269', in such a way that if the trip bar '157', Fig. 3, and Fig. 9, rises, the lever '268', rotates counterclockwise around the pin '253', causing the plate '252', to rotate in the same direction. Conversely, if the plate '252' is restrained from rotating, the trip bar is held down by the lever '268'.

2. Under shock conditions, the plate '252' is restrained from moving in the following manner: The studs '255 and 258', are suspended on pin '251'. The plate '252' contains a slot in its end, arranged so that the plate will slide down over the studs '255' and allow the circuit breaker to trip under normal tripping impulses.

3. Under shock conditions, however, the two outboard studs are caused to rotate around the pin '251' due to the off-center weights '257', and thus block the plate '252', preventing it from sliding down. The middle stud is actuated by a separately pivoted weight '257', which rotates about pin '264'. A spring '263', serves to hold the weight in the proper position during normal operation as shown.

c. Replacements

1. To replace the reset spring '262':

(a) Remove the cover screws '271' and cover

(b) Remove the device from the shelf by removing screws '256'.

(c) Remove the pin '253' and replace the spring '262'.

2. To replace the weight spring '263':

(a) Remove the cover screws '271' and cover

(b) Remove the device from the shelf by removing screws '256'. Remove the pin '264', which will free the weight '267', and allow the weight spring '263' to be replaced.

d. Adjustments

With the device mounted on the breaker shelf the lever '268', should be adjusted by means of a lock nut '270', and setscrew '269', so that it bears down slightly on the trip bar '157'.

SERIES-OVERCURRENT-TRIP DEVICE (Figs. 10 and 11)

a. Function

1. The series-overcurrent-trip device trips the circuit breaker automatically under two distinct conditions of overcurrent.

2. For overcurrents greater than the short-time delay pickup settings, but less than the instantaneous-pickup setting, the device will trip the breaker after a purposely-introduced short-time delay.

3. For overcurrents greater than the instantaneous-pickup setting, the device will trip the breaker instantaneously.

4. Refer to Fig. 10 for the characteristic curve of the trip units.

b. Description (Fig. 11)

1. The overcurrent-trip device consists of an electromagnet connected in series between the moving contact assembly of the pole unit and the lower stud. Under overcurrent conditions, the tube assembly '440', Fig. 11, rises, picks up the trip finger '242', and trips the circuit breaker. The tube assembly '440', is non-magnetic except for the armature '455'. An iron yoke '457', carries flux from the bottom of the armature '455', back to the top of the armature. When the overcurrent becomes high enough to exceed the calibration setting, the armature '455' moves up, pulling toggle and lever assembly '459' up with it, by means of pin '472'. The roller '464', bears on an end ring '467', which in turn pushes the tube '477' up and trips the circuit breaker.

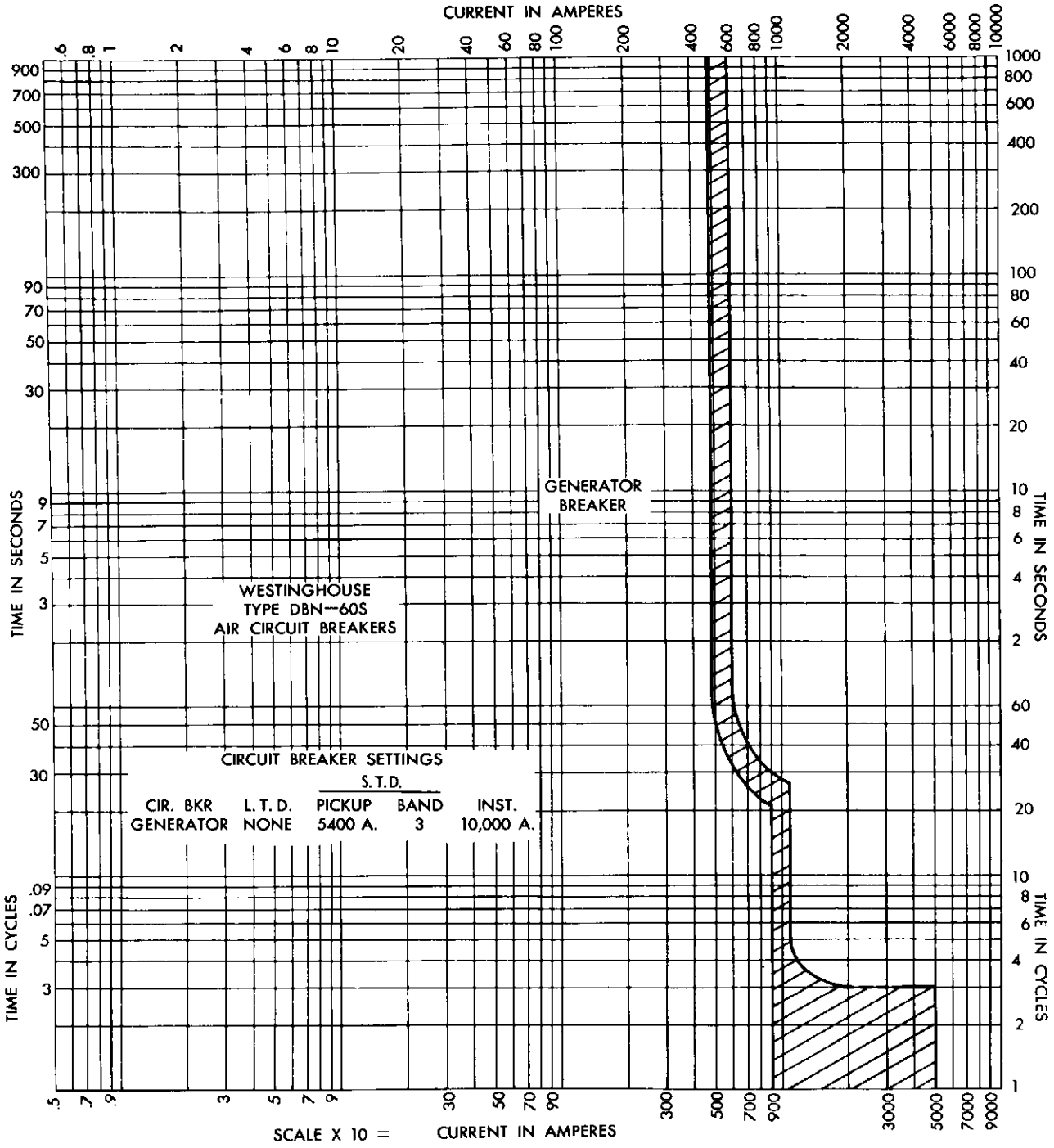
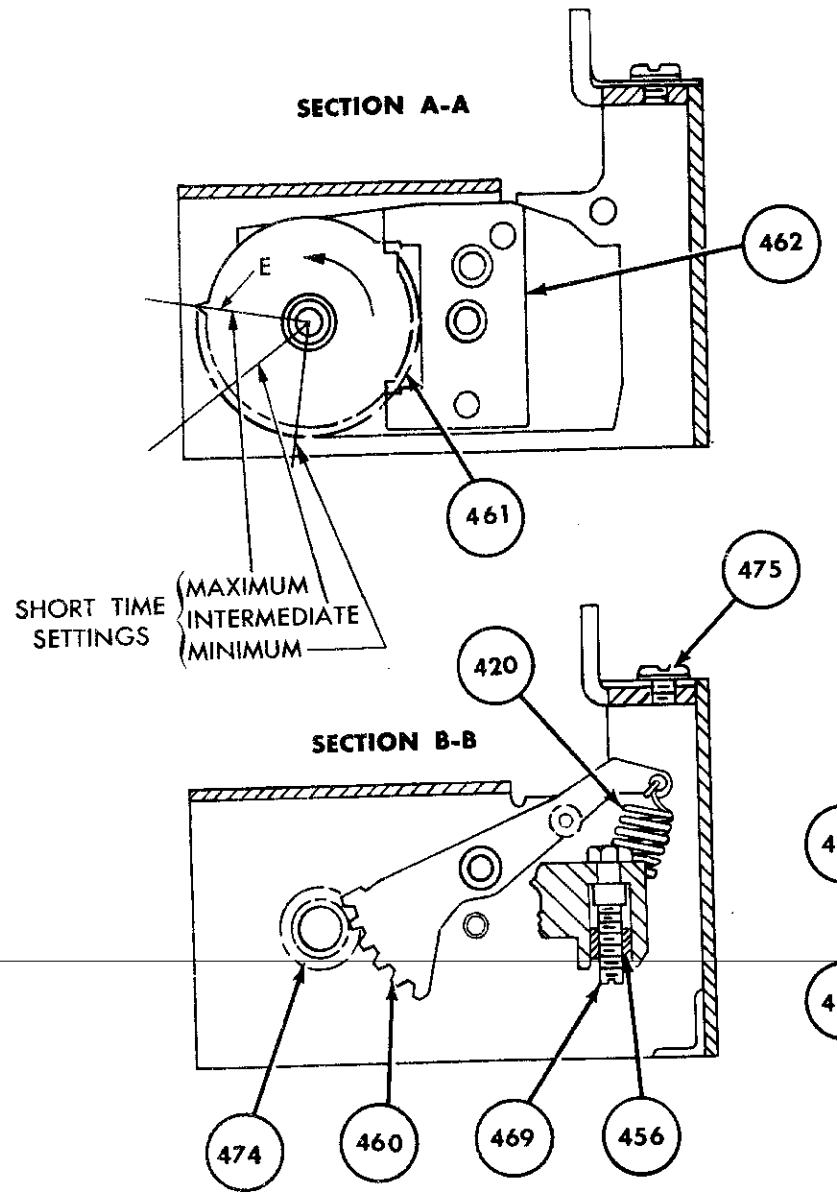
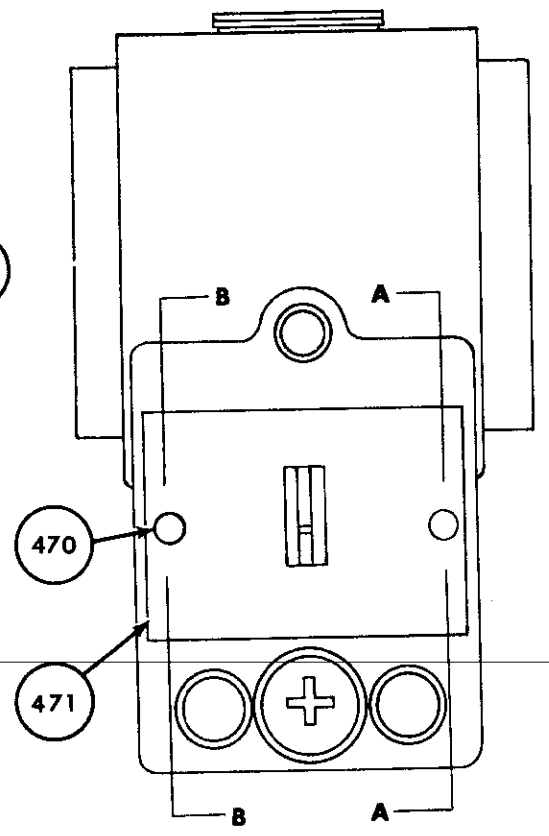
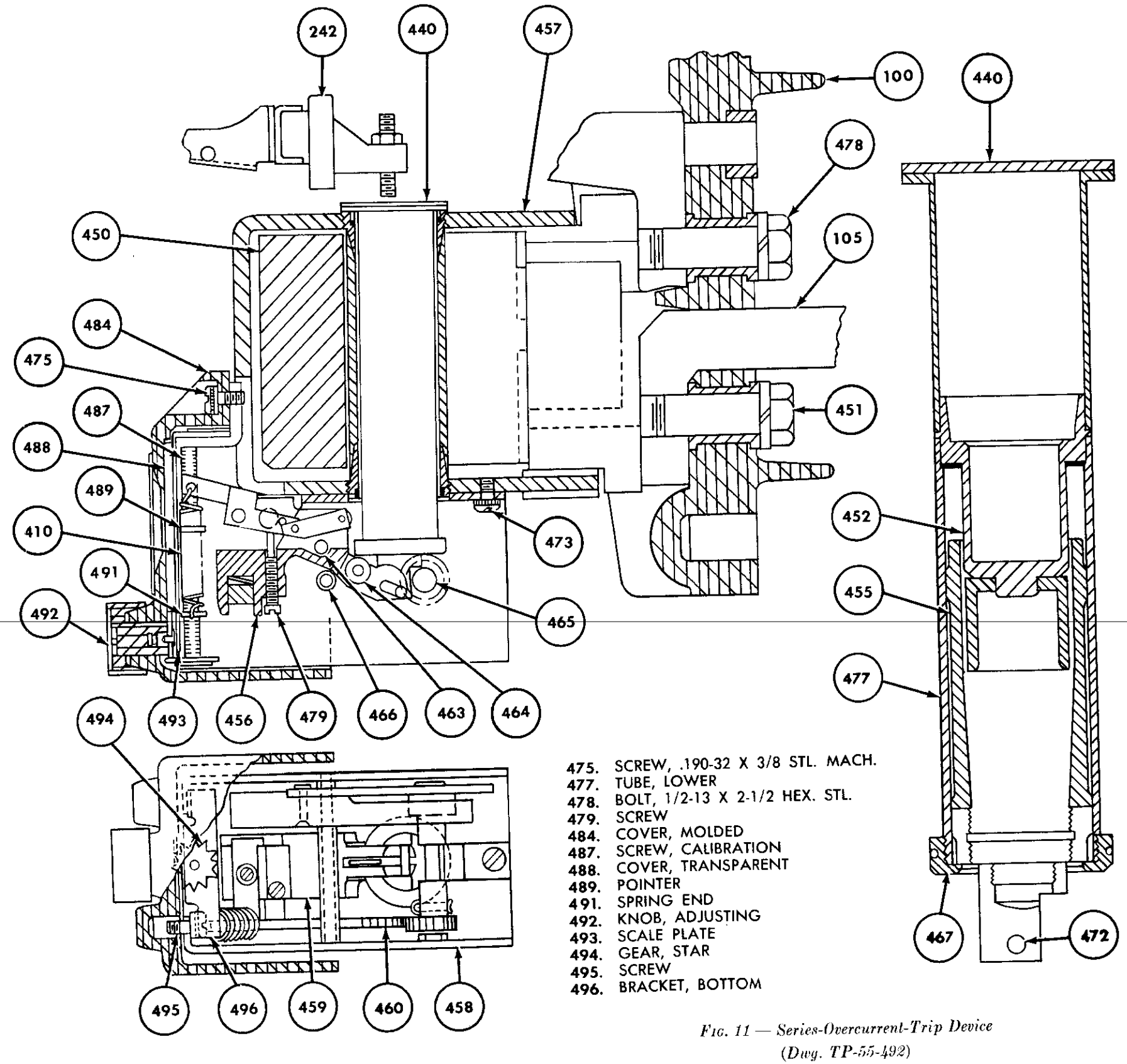


FIG. 10 — Overcurrent Tripping Curves
(Reference Curve 351881)

2. The calibration spring '410', is connected to the toggle and lever assembly through a system of linkages, and serves to hold the armature '455' down until an overcurrent causes a magnetic pull great enough to extend them. The lever '459', is pivoted on a pin '463', and connected through the instantaneous spring '420', to the gear segment '460', which operates the pinion '474', and oscillator wheel '461', on the same shaft. The oscillator wheel is restrained from free rotation by the oscillator '462'. This restraining action provides a short time delay. With fault currents of greater magni-







100. BASE, MOLDED
105. STUD, LOWER
242. FINGER, TRIP
410. SPRING, CALIBRATION
420. SPRING, INSTANTANEOUS
440. TUBE ASSEMBLY
450. COIL, CURRENT
451. BOLT, 1/2-13 X 2-1/2 HEX. STL.
452. PARTITION
455. ARMATURE
456. ARM
457. YOKE
458. HOUSING
459. TOGGLE AND LEVER ASSEMBLY
460. GEAR SEGMENT
461. OSCILLATOR WHEEL
462. OSCILLATOR
463. PIN
464. ROLLER
465. PIN
466. PIN
467. RING, END
469. SCREW, ADJUSTING
470. SCREW
471. NAMEPLATE
472. PIN
473. SCREW
474. PINION
475. SCREW, .190-32 X 3/8 STL. MACH.
477. TUBE, LOWER
478. BOLT, 1/2-13 X 2-1/2 HEX. STL.
479. SCREW
484. COVER, MOLDED
487. SCREW, CALIBRATION
488. COVER, TRANSPARENT
489. POINTER
491. SPRING END
492. KNOB, ADJUSTING
493. SCALE PLATE
494. GEAR, STAR
495. SCREW
496. BRACKET, BOTTOM

Fig. 11 — Series-Overcurrent-Trip Device (Dwg. TP-55-492)

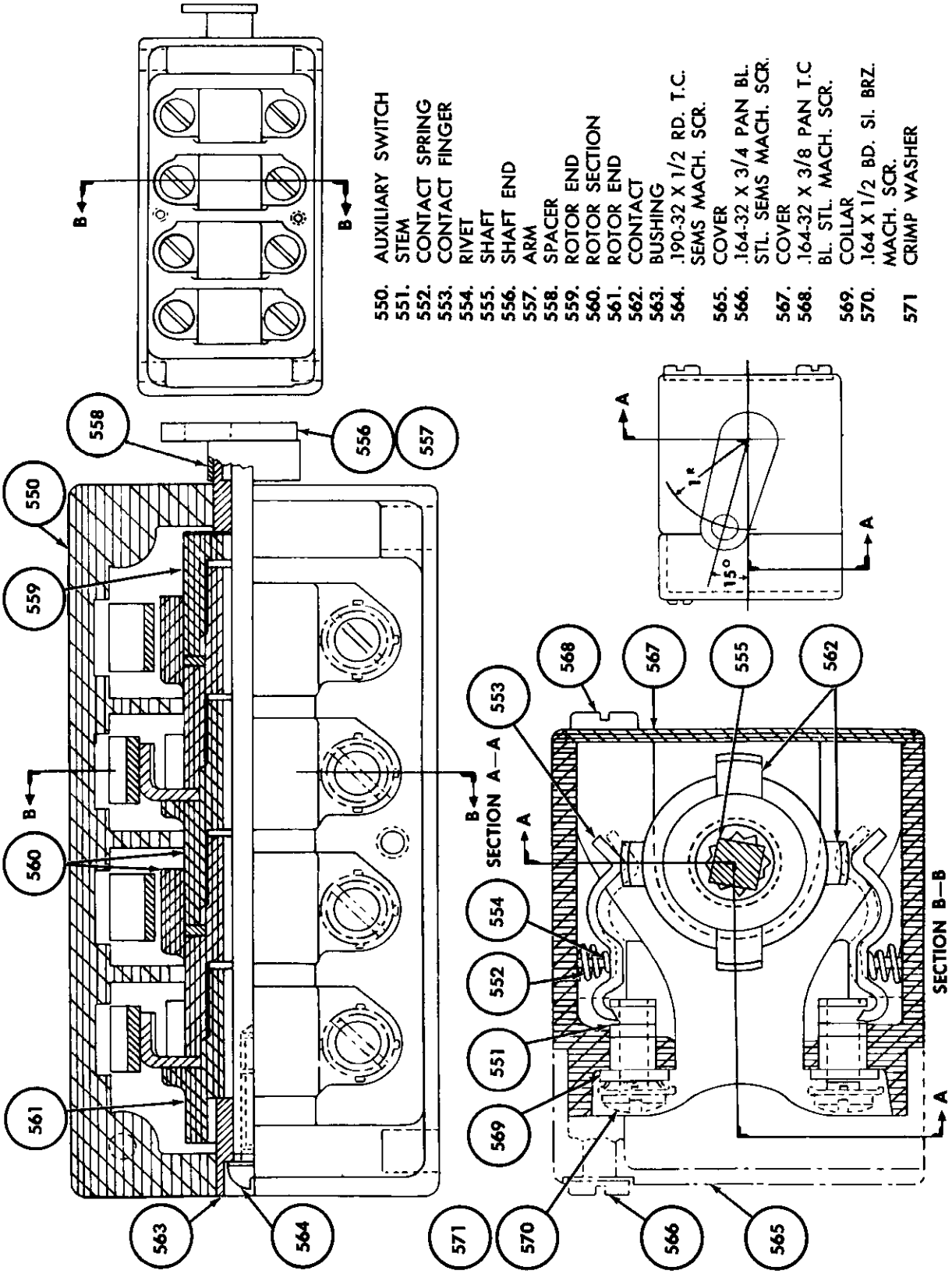


Fig. 12 — Auxiliary Control Switch
(Dwg. TP-55-493)

tude than the instantaneous-pickup setting, the instantaneous spring '420' extends, and the tube assembly '440', rises and trips the circuit breaker instantaneously, unimpeded by the mechanical escapement device.

c. Replacements

NOTE: Any field replacements on the over-current-trip device should be regarded as temporary, pending recalibration at the factory.

1. To replace the calibration springs '410':

(a) Remove the bolts '451 and 478', which free the device from the breaker.

(b) Remove the insulating cover '484', by removing the screws '475 and 495'. The calibration springs '410' are now accessible for replacement.

2. To replace the instantaneous spring '420':

(a) Remove the bolts '451 and 478' to free the device from the breaker.

(b) Remove the insulating cover '484', by removing screws '475 and 495'.

(c) Remove the housing '458', from the yoke '457', by removing screw '473'.

(d) Loosen adjusting screw '469' and replace the spring '420'.

(e) Center-punch the arm '456' lightly near the screw after replacement for locking purposes.

d. Adjustments. The scale plate '493', is marked for short-time-delay pickup as per contract. The adjusting knob '492', can be used to raise or lower the short-time-delay pickup point, if desired. Moving the pointer down increases the pickup current, and moving it up decreases the pickup current, by increasing or decreasing tensions in the calibration spring '410'.

AUXILIARY SWITCH (Fig. 12)

a. Function. The auxiliary switch is used to close or open the auxiliary or control circuits. The closed or open positions of its groups of contacts, are coordinated with the closed or open positions of the main circuit-breaker contacts as described under paragraph (b) following.

b. Description

1. The four-pole, Type "RC" auxiliary switch is mounted on the top of the supporting frame shelf, to the left of the operating mechanism. The switch is a shaft-operated, rotary type, having three "a" contacts and one "b" contact. An "a" contact is one that is open when the circuit breaker is open; a "b" contact is one that is closed when the circuit breaker is open. Terminals "1-2, 3-4, and 5-6" are connected to type "a" contacts, and terminals "7-8", connect to type "b" contact. The contacts are designed to carry 15 amperes continuously, or 250 amperes for three seconds.

2. The switch is operated by an arm '557', attached to a square shaft '555', extending through the rotor molds '560'. The molds serve to isolate and support the rotor contacts '562'. The rotor assembly is clamped together into a solid unit by a screw '564'. The rotor contacts are set for 90-degree rotation of the shaft '555'. Contact fingers '553', have one end hooked into the stem '551', with the spring '552', maintaining pressure between the finger contact and stem. The center of the contact finger bears against a stop surface in the casing, to position the outer end of the contact finger.

c. Replacement

1. To replace the auxiliary switch:

(a) Remove and tag the terminal connections.

(b) Disconnect the arm '557', from the breaker lever.

(c) Remove the two mounting bolts, and remove the switch.

(d) Remove the arm from closing lever and add to the new switch.

UNDERVOLTAGE TRIP (Fig. 13)

a. Function. The undervoltage-trip device mounts on top of the shelf (platform), to the right of the anti-shock-open device. Its function is to trip the breaker when the voltage falls between 10 to 40 per cent of normal (50 to 200 volts d-c). A resistor is connected in series and mounted on back of breaker.

b. Description

1. The moving core '804', is normally held magnetically against the stationary core '803', to hold the plunger '816', and consequently the reset lever '815', in the reset position. When the coil '801' voltage is reduced sufficiently, the rest-lever spring '812', overcomes the magnetic attraction of the cores and rotates the reset lever clockwise. As the reset lever rotates, the reset-lever pin '827', pushes against the latch '805', to release it from its latch plate '819'. When the latch releases, the trip spring '811', rotates the trip lever '808', counter-clockwise to trip the breaker. The linkage is reset by the crossbar '168' as the breaker opens.

2. In order for moving core '804', to move and trip the breaker as described above, lever '824', wheel '822', and ticker '823', must be moved. Rotation of wheel and oscillation of ticker introduces a small time delay which prevents shock from parting the magnetic cores.

3. To check the mechanical operation of the undervoltage-trip device de-energize the coil and hold the trip bar down. Close the breaker manually, and release the trip bar slowly, allowing the under-

voltage-trip lever to raise the trip bar and open the breaker.

c. Replacements

1. To replace voltage coil '801':

(a) Remove undervoltage-trip device from breaker by disconnecting the coil leads and removing the two 5/16 mounting bolts.

(b) Remove bracket '821', by removing screws '829' and '830', and pin '831'.

(c) Remove rear cover '820', by removing the two mounting screws. Moving core '804', and tube '802', can now be removed.

(d) Remove stationary core '803', by removing screw '828'. Plunger '816' can now be disengaged from reset lever '815'.

(e) Voltage coil is now free to be replaced.

2. To replace springs '807', '811', '812' and '814':

(a) Remove undervoltage trip as above.

(b) Remove proper pins and replace spring.

d. Repair Parts. The repair parts shown in table Fig. 15 were included with the undervoltage-trip devices.

REVERSE-CURRENT TRIP (Fig. 14)

a. Function. This device has application on direct-current breakers only. It will instantaneoulsy trip the circuit breaker when the current flows in its series coil in the reverse direction and exceeds the calibration setting. This device is set and marked in amperes at the factory, at 5 per cent or more of the rated continuous current of the circuit-breaker overcurrent-trip coils.

b. Description

1. This device '600', is mounted on the center insulating base of a two-pole breaker and the top terminal of its current coil is connected to the upper stud of the circuit breaker. A copper connector connects the upper stud to the lower stud of the right-hand pole. Thus the series coil '624', of the reverse-current-trip device, is connected in series with the right-hand pole overcurrent-trip coil.

2. The potential coil '623', is connected directly across the line through an "a" contact of the auxiliary switch. This demagnetizes the armature '603', when the breaker trips on a reverse-current and permits calibration spring '612', to reset it.

3. The main structural parts of the device consist of a yoke '600', a pole piece '601', a core '610', and an armature '603', all of magnetic steel. Bearing casting '602' of non-magnetic material, is drilled for pin '621', about which armature '603', has a limited freedom of rotation. If armature '603', rotates counter-clockwise, it pulls pin '619', and link '606', with it. After link '606' has traveled some distance, the slot in its end engages pin '622', of trip lever '605', and moves it to the left. This causes trip lever '605', to rotate clockwise about fixed pin '602', in bearing casting '602'. This rotation causes the trip lever '605', to move breaker-trip screw up thus causing the circuit breaker to trip.

4. Each of the coils of the device, the potential coil '623', and the series coil '624', has its own magnetic circuit. With forward current flowing in series coil '624', pole 'B' is a south pole, say, and pole 'A', is a north pole. At the bottom of the magnetic circuit of series coil '624', pole 'D' is a north pole and pole 'C' is a south pole as far as the series-coil magnetic circuit is concerned. In the potential-coil magnetic circuit, pole 'E' is a north pole and pole 'C' is a south pole as far as the potential-coil magnetic circuit is concerned. It can be seen that under the circumstances of forward-current flow in the series coil, the magnetic pull between unlike poles 'C' and 'D' will hold armature '603' immobile, since pole 'C' is a strong south pole, due to flux from both coils, while pole 'D' is a north pole due to flux of series coil.

5. When the current in series coil '624' reverses, poles 'A' and 'B' change their polarity to south and north respectively, and pole 'D' changes to a south pole. Since pole 'E' is still a north pole due to the potential coil, there is now an attraction between poles 'D' and 'E' where repulsion existed before. Pole 'C' is still a south pole as far as the potential coil is concerned but has become a north pole with respect to the series coil. The net result is that pole 'C' becomes very weak and as soon as the attraction between unlike poles 'A' and 'B' and the attraction between unlike poles 'D' and 'E' becomes strong enough to overcome the tension in calibration spring '612', the armature rotates counter-clockwise and trips the circuit breaker as described before.

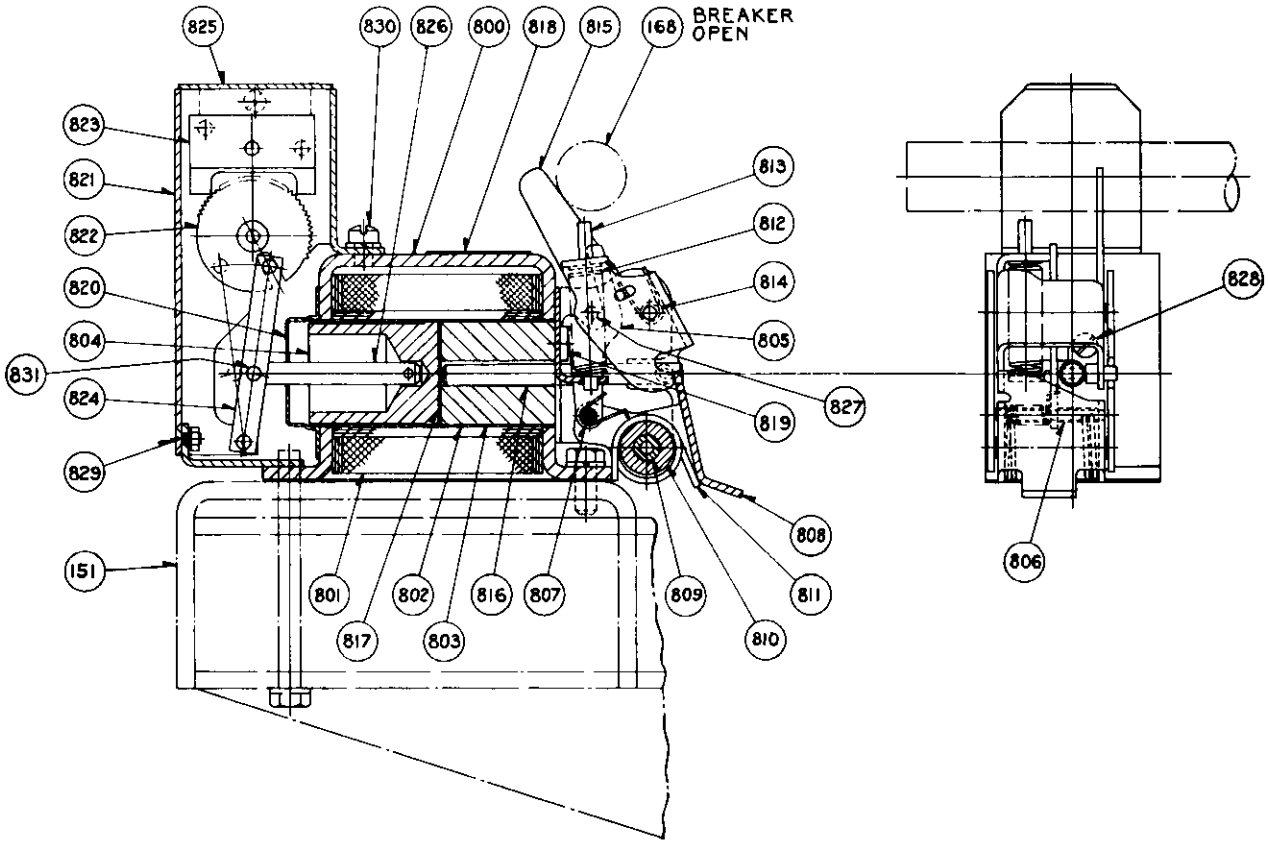
6. This device is set at the factory and should not be tampered with in the field. However, it may be necessary to make a field adjustment in case calibration spring '612' has been replaced.

(a) Remove two screws in nameplate and remove nameplate from device.

(b) Remove locking piece '609'.

(c) Calibration screw '613', has a square cross section and may be turned with a small wrench. Turning screw '613' so that arm '608' moves down increases the calibration setting of the device; turning in the other direction decreases the setting. The screw should be set so that the amount of reverse current indicated on the nameplate will just trip the circuit breaker.

7. By the addition of an air dashpot, a reverse-current trip with delayed tripping can be supplied. When armature '603' attempts to move counter-clockwise, pin '636' will restrict motion until latch '635' is free; as latch '635' moves to right, it rotates



151	PLATFORM	810	BUSHING	822	WHEEL ASSEM.
168	CROSSBAR	*811	SPRING, TRIP	823	TICKER ASSEM.
800	FRAME	*812	SPRING, RESET LEVER	824	LEVER
*801	COIL	813	SPRING GUIDE	825	COVER
802	TUBE	*814	SPRING, ANTI. SHOCK	826	ROD
803	STATIONARY CORE	815	RESET LEVER	827	RESET LEVER PIN
804	MOVING CORE	816	PLUNGER	828	PAN HEAD SCREW
805	LATCH	817	WASHER	829	FLAT HD. SCREW
806	SPACER	818	NAME PLATE	830	FIL. HD. SCREW
*807	SPRING, TRIGGER RESET	819	LATCH PLATE	831	PIN
808	TRIP LEVER	820	COVER	*832	RESISTOR †
809	SPACER	821	BRACKET ASSEM.		

*REPAIR PARTS †SEE FIG. 3 FOR LOCATION.

FIG. 13 — Undervoltage Trip Device
(Dwg. TP-57-236)

lever '630' counter-clockwise about pin '647', moving pin '628', and compressing diaphragm '632', the amount of delay in this motion is determined by the orifice leading into filter '640'. After lever '630' has rotated far enough to free latch '635', latch '635' and armature '603' move unrestricted to trip breaker.

8. The amount of delay is factory-set by setting of screw '638', which controls the orifice, and screw '645', which controls the engagement of latch '635' with lever '630'. Any field adjustments should be limited to screw '638'. Turning screw '638' a slight amount clockwise will increase delay.

c. Replacements

1. Remove wiring and then reverse-current trip by removing bolts '642'.

2. To replace calibration spring '612': This can be done directly without removing other parts.

3. To replace potential coil '623':

(a) Remove nameplate, screw '613', and screw '611'.

(b) Loosen screws '627', tilt yoke '600', away from coil, and pull coil '623', off boss on pole piece '601' and replace.

4. To replace latch reset spring '637':

(a) Remove coil '623', as above.

(b) Remove pin '636', and replace spring '637'.

5. To replace diaphragm '632', or '648':

(a) Remove screws '641', slide spacers '618' and cover '631' down, until lever '630' disengages pin '628'.

(b) Diaphragm '632', and diaphragm spring '648', are now accessible for replacement.

REPAIR PARTS

Potential coils, springs, arcing contacts, and auxiliary switches are supplied as repair parts. For style number identification refer to Repair Part Certification Data Sheet Fig. 15.

100	MOLDED BASE	617	PIN	636	PIN
		618	SPACER	* 637	SPRING, ROD RESET
600	YOKE	619	PIN	638	ADJUSTING SCREW
601	POLE PIECE	620	PIN	639	LOCKNUT
602	BEARING CASTING	621	PIN	640	FILTER
603	ARMATURE	622	PIN	641	.190 -32 FIL. HD. MACH. SCREW
604	LUG	* 623	COIL, POTENTIAL	642	1/2-13 X2 1/4 HEX.STL. BOLT
605	TRIP LEVER	624	COIL, SERIES	643	1/2-13 X 1 1/2 HEX.STL. BOLT
606	LINK	625	TUBE	644	3/8-16 X 1 HEX ST L. BOLT
607	BAND	626	WASHER	645	ADJUSTING SCREW
608	ARM	627	FLAT HD. SCREW	646	CONNECTOR
609	LOCKING PIECE	628	DIAPHRAGM PIN	647	PIN
610	CORE	629	WASHER	* 648	SPRING, DIAPHRAGM RETURN
611	5/16-18 X3 FLAT HD.STL.MACH.SCREW	630	LEVER		
* 612	SPRING, CALIBRATION	631	COVER		
613	CALIBRATION SCREW	* 632	DIAPHRAGM, SILASTIC RUBBER		
614	1/4-20 SET SCREW				
615	BRACKET	635	LATCH		
616	SPACER				

* REPAIR PARTS

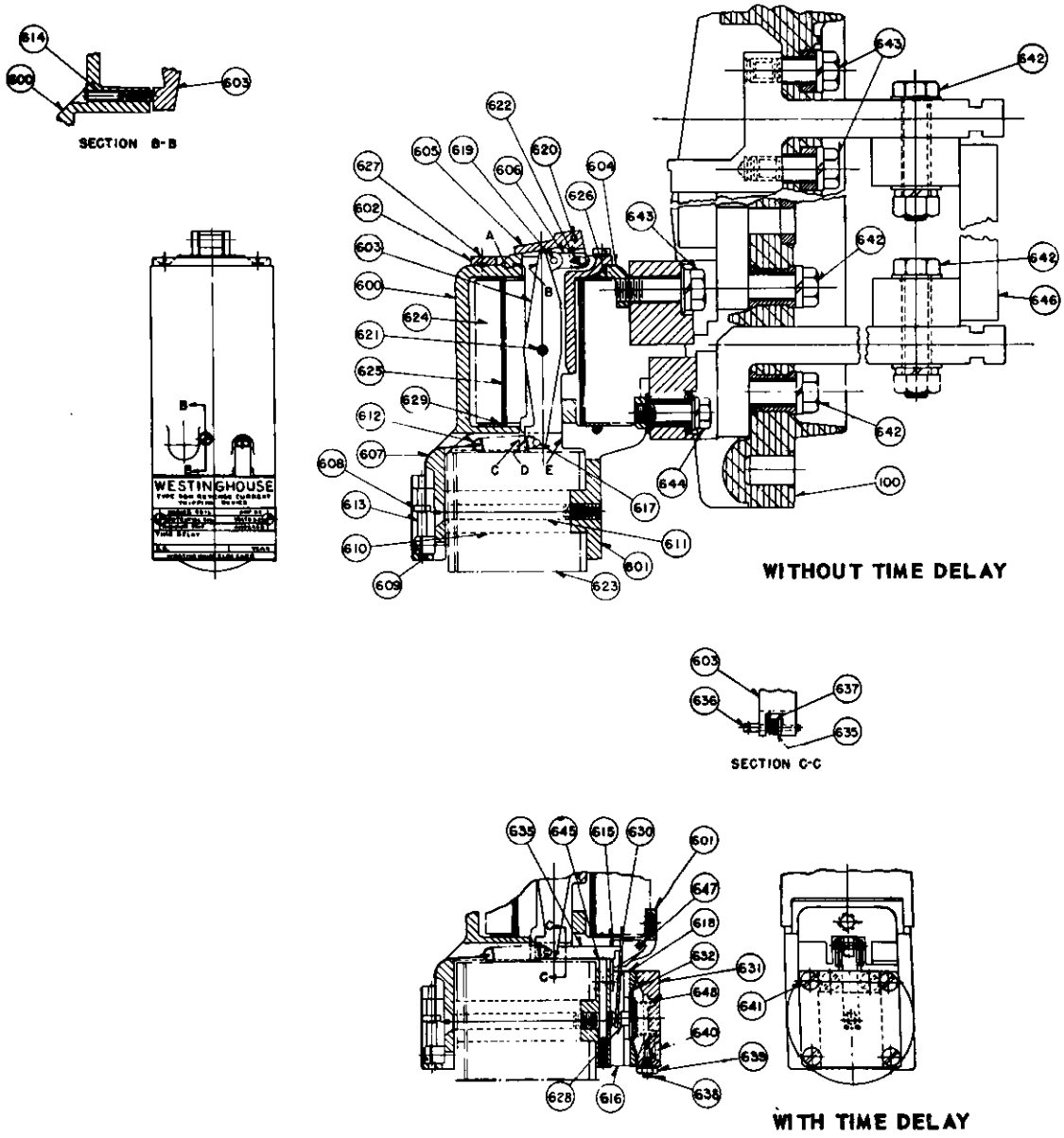


FIG. 14 — Reverse-Current Trip Device
(Dwg. TP-56-202)

REVISIONS					
REV		MFR DATE	MFR APPD	USN DATE	USN APPD
B	REVISED BY BU LTR.				
	NOBS 73085 14 JAN 1957				
C	REVISED PER SUPSHIPS LTR				
	26 AUG 1957 SS581/582/CCO-104				
	(REF FOR SS582 ALSO ADDED)				
D	SHEET 1 LINE I I-DID NOT				
	SHOW 2000 A FOR SS 581-582				

SS 3 [illegible] - 5.4111 - 1335724/
3925 - 620 - 2737

MANUFACTURERS			NAVY CONTRACT		ON BOARD		SPARE	TECH.	SETS
G O	S O	SHIP SS-	NO.	M & E	BKRS	REPAIR PARTS	BKRS	MANUAL	OF DWGS
WG-75185Y	35Y2203	563-566	NOBS 73085		12	12	(1)	200	1
WG-75185Y	35Y4501	580	NOBS 73085		3	1	—	—	—
BH72933Y	35Y6232	581	NOBS 3862	A	3	1			
PH45133Y	35Y5143	582	NOBS 3860		3	1			

CIRCUIT BREAKERS 16 (15 + 1 SPARE UNIT)
REPAIR PARTS: 12 SETS FOR 12 BREAKERS (SS 563 THRU 566)
1 SHIPBOARD SET FOR 3 BREAKERS (SS580)
1 SHIPBOARD SET FOR 3 BREAKERS (SS581)
1 SHIPBOARD SET FOR 3 BREAKERS (SS582)
MASTER DWG. W.E. CORP. # 1-JH-220
BUSHIPS # S6203-3-102, 132 REV C

TECHNICAL MANUALS - 200 W.E CORP. 35-270-C18

NOTES:
A: INGALLS P.O. CCO-104, S. 581

DRAFTSMAN [illegible] 11/28/ G.M. KURIX SE CHECKER CERTIFIED	CERTIFICATION DATA TYPE DBN-60S AIR CIRCUIT BREAKER GENERATOR BKR SS563 THRU 566, 580, 581 & 582 CONTRACT NOBS-73085	WESTINGHOUSE ELECTRIC CORPORATION EAST PITTSBURGH PA. U.S.A. DWG. 405D213 SUB 7 BUSHIPS DWG. NO. REV. SS563-302-1617385 D SHEET 1 OF 7
APPROVAL LTR BUSHIPS LTR. SER. 560-36499 OF 4-12-51		

FIG. 15 — Generator Circuit Breaker Certification Data
(Dwg. 405D213)

CERTIFICATION DATA FOR CIRCUIT BREAKERS

A MASTER DRAWING S6202-3,102,132 REVISION C
B. MFR'S DRAWING NO. 1-JH-220 REVISION 13
C. MASTER DRAWING FIGURES APPLICABLE TO CONTRACT 1-3B-45A-6
WIRING DIAGRAM SHEET 5
D APPLICABLE SPECIFICATION MIL-C-17587+MIL-C-15960 OF
AND AMENDMENTS OF
E NAVY CONTRACT OR SHIPBUILDER'S ORDER NO. NOBS-73085
F MFR'S ORDER NO. SEE SHEET 1
G CIRCUIT BREAKER TYPE AND FRAME SIZE-NAVY ACB 1600 FRAME
MFR'S. DBN-605
H. DESCRIPTION OF CIRCUIT BREAKER
VOLTAGE 710 D C MEANS OF CLOSING ELECTRIC & MANUAL
NO. OF POLES 2 NO. OF OVERCURRENT COILS 2
CONNECTIONS BACK MOUNTING DEAD FRONT
AUXILLIARY SWITCH CIRCUITS 4 (3a+1b) SEE SH. 7
OVERCURRENT TRIPPING CURVE MFR'S. NO. 361881 (GENERATOR BKR)
I. COIL RATINGS, PICKUP AND TIME SETTINGS:-
1. OVERCURRENT COIL RATING-AMPERES (SEE 0-5) 2000-(S5581+582) 1750 (S5563-566+580)
2. LONG-TIME DELAY PICKUP SETTING-AMPERES NONE
3. SHORT TIME DELAY PICKUP SETTING-AMPERES 5400
4. SHORT TIME DELAY BAND SETTING 3
5. INSTANTANEOUS PICKUP SETTING 10,000
6. UNDERVOLT TRIP COIL RATING-VOLTS SEE NOTE "A" SHEET 4
7. CLOSE COIL RATING — VOLTS 500 (355 TO 710)
8. CLOSING RELAY COIL RATING-VOLTS 500 (355 TO 710)
9. REVERSE CURRENT TRIP SETTING - AMPERES 240 (SEE NOTE 01)
10. REVERSE CURRENT POTENTIAL COIL - VOLTS 500 (355 TO 710)
J. NUMBER OF SHIPS INVOLVED 5
K. IDENTIFICATION NUMBERS OF SHIPS S5563 THRU 566 + 580 + 581 + 582
L. NUMBER OF CIRCUIT BREAKERS PER SHIP 3+1 (3 SETS OF REPAIR PARTS FOR S5563 THRU 566; 1 SET OF REPAIR PARTS FOR S5580-581-582)
M. TOTAL NO. OF CIRCUIT BREAKERS INVOLVED 16 (15+1 SPARE)
N. REPAIR PARTS SHEETS 3 & 4 FOR S5580-581-582 AND SHEETS 6 & 7 FOR S5563 THRU 566
O. ADDITIONAL DATA, REMARKS, NOTES.-

1. TIME DELAY 5 TO 10 SEC.
2. HOLD-IN OMITTED
3. ENCLOSURE SUPPLIED
4. TECHNICAL MANUAL W.E.CORP. 35-270 : CIB BUSHIPS NAVSHIPS 362
5. NAME PLATE MARKING ONLY DIFFERENCE IN OVERCURRENT TRIP DEVICES

CERTIFICATION DATA	WESTINGHOUSE ELECTRIC CORPORATION
TYPE DBN 605	EAST PITTSBURGH PA USA
AIR CIRCUIT BREAKER	DWG 405D213 SUB 7
GENERATOR BKR	BUSHIPS DWG NO. / REV.
S5563 THRU 566, 580, 581 & 582	S5563-302-1617385 / D
CONTRACT NOBS-73085	SHEET 2 OF 7

FIG. 15 — Generator Circuit Breaker Certification Data
(Dwg. 405D213)

REPAIR PARTS LIST

ITEM NO	NUMBER OF REPAIR PARTS	NO INSTALLED PER VESSEL	NAME OF PART	IDENTIFICATION			
				WESTINGHOUSE			STANDARD NAVY STOCK NO.
				STYLE NO.	WT LB	DRAWING NO.	
1	1	3	SPRING ROLLER LATCH	1584519	.01	8D 3981	PS 20-5 10720
2	1	3	SPRING - PAWL	1581956	.03	8D 3981	PS 20 5 10721
3	3	6	AUXILIARY SWITCH	1581958	.9	18A 3835	PM17-WX-1983
4	3	12	SPRING - ACCELERATING	1584468	.03	18D 6383	Ps 20-5-10722
5	5	24	SPRING - MAIN CONTACT	1584469	.05	18D 6383	Ps 20-5-10723
6	3	12	SPRING - BRIDGE	1584470	.08	18D 6383	PS 20-5 10724
7	1	3	SPRING - ANTI-SHOCK IN	1611996	.02	23D 5209	PN42-WX-3447
8	1	3	SPRING- ANTI-SHOCK OUT	1584521	.02	21D 4345	Ps 20-5-10726
9	1	3	SPRING- ANTI-SHOCK OUT	1584522	.02	9D 9236	Ps 20-5-10727
10	1	3	SPRING- RELAY ANTI-SHOCK TR	1584396	.008	18D 6383	Ps 20-5-10728
11	3	12	SPRING- CALIBRATION (O.C.)	1574796	.02	19D 8833	Ps 20-5-10732
12	2	6	SPRING- (O.C. INST)	1611882	.02	19D 8833	P205-11141
13	6	6	CONTACT-MOVING (ARCING)	1584472	.8	28A 1391	PF17-WX-1987
14	6	6	CONTACT- STATIONARY (ARCING)	1584473	.5	22B 1721	PM17-WX-1988
15	2	3	COIL (SOLENOID) 500 V.D.C.	1640826	16	L-50/248	
16	1	3	SPRING - ARM. (RELAY)	1574332	.02	17D 5806	PN20-5-10808
17	1	3	SPRING - LATCH (RELAY)	1491484	.02	17D 5806	PS 205-10736
18	1	3	SPRING - TRIP (RELAY)	1533822	.02	18D 9176	PS 205-10737
19	3	3	CONTACT- STAT. R.H. (RELAY)	1589492	.03	23A 3609	H17-WX-12884
20	3	6	CONTACT - MOVING (RELAY)	1589495	.03	23A 3609	PN17-WX-3352
21	2	6	SPRING - CONTACT (RELAY)	1491306	.01	17D 5806	P205-10738
22	3	6	BLOWOUT COIL & BKT (RELAY)	1802612	.05	13C 9668	
23	2	3	Coil (RELAY) 500 V.D.C.	1640827	.66	L-50/249	
24	1	3	SPRING (STAT. ARCING CONT.)	1584471	.08	18D 6383	P205-10730
25	1	3	SPRING - HANDLE STOP	1589485	.02	21D 7417	PN17-WX-2107
26	2	3	COIL - (REV. CURR.) 500 V.D.C.	1589480	1.8	L-500023	P17 WX-2108
27	1	3	DIAPHRAGM (REV. CURR.)	1809217	03	60A 4971	
28	1	3	SPRING - S.T.D. RESET (REV. CURR.)	1809178	.003	31D 6562	
29	1	3	SPRING- (CALIB. REV. CURR.)	1589382	.02	18D 9178	P17 WX-2111
30	1	3	SPRING - S.T.D. LATCH (REV. CURR.)	1581752	.0003	21D 7414	P17 WX-2112

CERTIFICATION DATA

TYPE DBN-60S

AIR CIRCUIT BREAKER

GENERATOR BKR

SS 580, 581, & 582

S.O. 35Y4501-35Y6232-35Y5443

CONTRACT NOBS-73085

WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH PA USA

SUB

DWG. 405D213

BUSHIPS DWG. NO.	REV.
55563-302-1617385	D

SHEET 3 OF 7

FIG. 15 — Generator Circuit Breaker Certification Data
(Dwg. 405D213)

REPAIR PARTS LIST

ITEM NO	NUMBER OF REPAIR PARTS	NO INSTALLED PER VESSEL	NAME OF PART	IDENTIFICATION			
				WESTINGHOUSE			STANDARD NAVY STOCK NO.
				STYLE NO.		DRAWING NO.	
31	2	3	COIL (U.V.) SEE NOTE "A"	300P233601	2.0	L-547112	
32	1	3	SPRING - TRIGGER (U.V.)	1615408	.002	22 B 7919	P425 16339-9600
33	1	3	SPRING - TRIP LEVER (U.V.)	1615407	.076	22 B 7919	P425-16339 9650
34	2	6	ARC CHUTE	1799033		32A 2915	
35	1	3	SPRING - RESET (U.V.)	1615406	.02	13 D 8370	P425-16338-2465
36	1	3	SPRING - OPER. LEVER (U.V.)	1809109	.01	52D4743	
37	2	3	RESISTOR SEE NOTE "B"				
38	3	3	CONTACT STAT. L.H. (RELAY	1589493	.03	23A3609	P17-WX-3351

NOTE "B" WARD LEONARD 3300 OHM 35 WATT RESISTOR IT.5 OF DWG. 16559 BUSHIPS TR 81321 (VITROHM RESISTOR) (SUPPLIED AND MOUNTED ON REAR OF BKR. BASE).

NOTE "A" - 250V COIL FOR USE WITH RESISTOR ON 500V LINE

	VOLTG. RANGE	DUTY	DROP OUT VOLTG.
COIL ONLY	175-355 DC	CONTINUOUS	25-100 DC.
COIL + RES.	355-710 DC	CONTINUOUS	50-200 DC.
RES ONLY	175-355 DC.	CONTINUOUS	———
RES. ONLY	355-710 DC.	INTERMITTENT	———

CERTIFICATION DATA

TYPE DBN-60S

AIR CIRCUIT BREAKER

GENERATOR BKR.

SS 580, 581, & 582

S.O. 35Y4501-35Y6232-35Y5443

CONTRACT NOBS-73085

WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH PA USA

DWG. 405D213 SUB 7

BUSHIPS DWG. NO.	REV.
SS 563-302-1617385	D

SHEET 4 OF 7

FIG. 15 — Generator Circuit Breaker Certification Data (Dwg. 405D213)

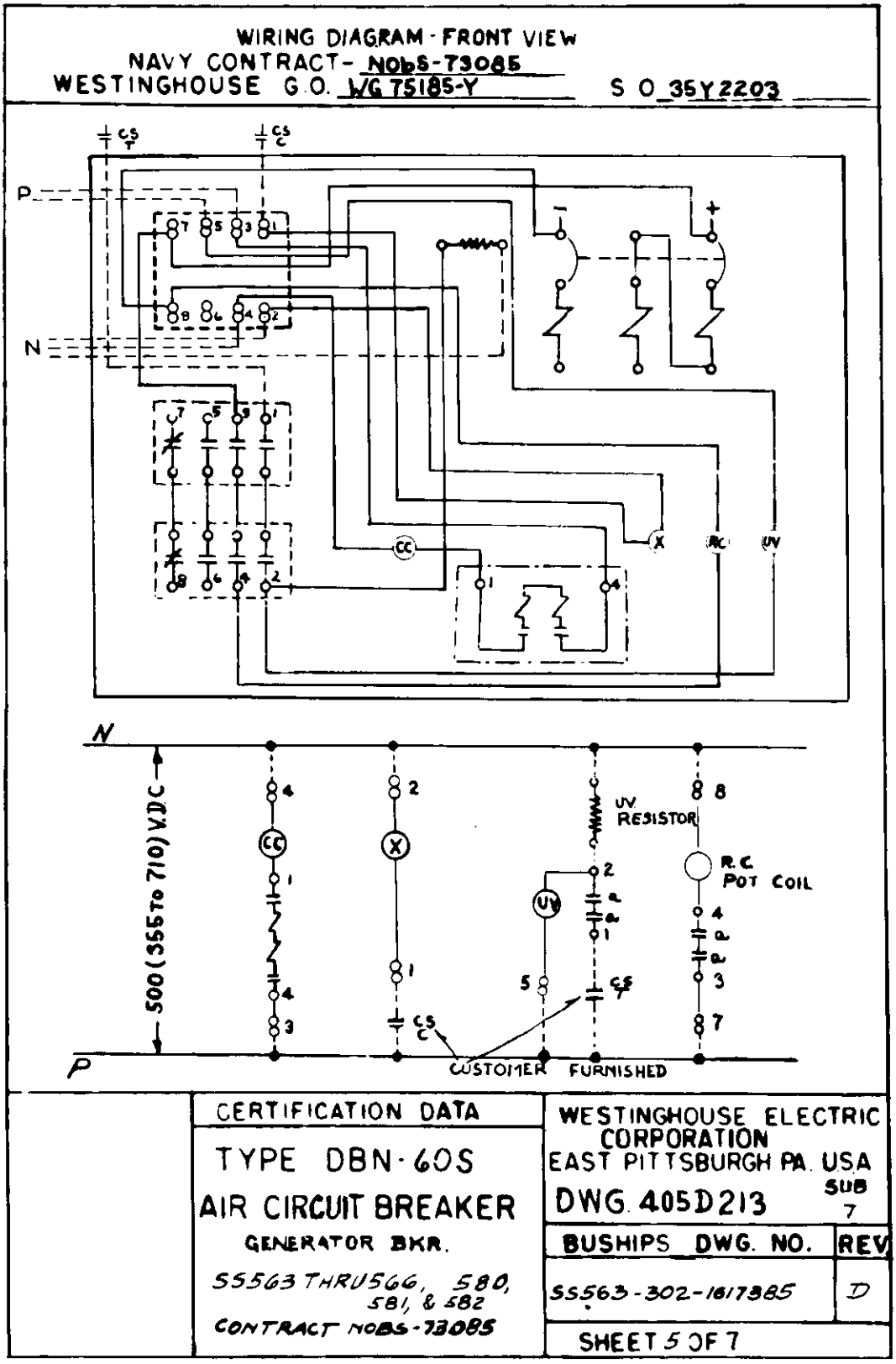


FIG. 15 — Generator Circuit Breaker Certification Data
(Dwg. 405D213)

REPAIR PARTS LIST

ITEM NO	NO. PER SET (NOTE C)	No. PER CKT. BKR	NAME OF PART	IDENTIFICATION			
				WESTINGHOUSE			STANDARD NAVY STOCK NO.
				STYLE NO.	WT LB	DRAWING NO.	
51	1	1	SPRING ROLLER LATCH	1584519	.01	8 D 3981	PS 20-5-10720
52	1	1	SPRING - PAWL	1581956	.03	8 D 3981	PS 20-5-10721
53	2	2	AUXILIARY SWITCH	1581958	.9	18A 3835	PM17-WX-1983
54	1	4	SPRING - ACCELERATING	1584468	.03	18 D 6383	PS 20-5-10722
55	2	8	SPRING - MAIN CONTACT	1584469	.05	18 D 6383	PS 20-5-10723
56	1	4	SPRING - BRIDGE	1584470	.08	18D 6383	PS 20-5-10724
57	1	1	SPRING - ANTI-SHOCK IN	1611996	.02	23 D 5209	PN42-WX-3447
58	1	1	SPRING - ANTI-SHOCK OUT	1584521	.02	21 D 4345	PS 20-5-10726
59	1	1	SPRING - ANTI-SHOCK OUT	1584522	.02	9 D 9236	PS 20-5-10727
60	1	1	SPRING - RELAY ANTI-SHOCK TR	1584396	.009	18 D 6383	PS 20 5-10728
61	1	4	SPRING - CALIBRATION (O.C.)	1574796	.02	19 D 8833	PS 20-5-10732
62	1	2	SPRING - (O.C. INST)	1611892	.02	19 D 8833	P 205 - 11141
63	2	2	CONTACT - MOVING (ARCING)	1584472	.8	28 A 1391	PF17-WX-1987
64	2	2	CONTACT - STATIONARY (ARCING	1584473	.5	22 B 1721	PM17-WX-1988
65	1	1	COIL (SOLENOID) 500 V.D.C.	1640826	16	L-50248	
66	1	1	SPRING - ARM. (RELAY)	1574332	.02	17 D 5806	PN 20-5-10808
67	1	1	SPRING - LATCH (RELAY)	1491484	.02	17 D 5806	PS 205-10736
68	1	1	SPRING - TRIP (RELAY)	1533822	.02	18 D 9176	PS 205-10737
69	1	1	CONTACT - STAT. R H (RELAY)	1589492	.03	23 A 3609	H17-WX-12884
70	2	2	CONTACT - MOVING (RELAY)	1589495	.03	23 A 3609	PN17 WX-3352
71	1	2	SPRING - CONTACT (RELAY)	1491306	.01	17 D 5806	P205 - 10738
72	2	2	BLOWOUT COIL & BKT (RELAY)	1802612	.05	13C 9668	
73	1	1	COIL (RELAY) 500 V.D.C.	1640827	.66	L-50249	
74	1	1	SPRING (STAT. ARCING CONT.)	1584471	.08	18D 6383	P205-10730
75	1	1	SPRING - HANDLE STOP	1589485	.02	21D 7417	PN17-WX-2107
76	1	1	COIL - (REV. CURR.) 500 V.D.C.	1589480	1.8	L-500023	P17 WX-2108
77	1	1	DIAPHRAGM (REV. CURR.)	1809217	.03	60A 4371	
78	1	1	SPRING - S.T.D. RESET (REV. CURR.)	1809178	.003	31 D 6562	
79	1	1	SPRING - (CALIB. REV. CURR.)	1589382	.02	18D 9178	P17 WX-2111
80	1	1	SPRING - S.T.D. LATCH (REV. CURR)	1581752	.009	21D 7414	P17 WX-2112

CERTIFICATION DATA

TYPE DBN-60S

AIR CIRCUIT BREAKER

GENERATOR BKR

55563 THRU 566

50 35Y2203

CONTRACT NOBS-73085

WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH PA. U.S.A.

DWG. 405D213 SUB 7

BUSHIPS DWG. NO.	REV.
55563-302-1617385	D

SHEET 6 OF 7

FIG. 15 — Generator Circuit Breaker Certification Data
(Dwg. 405D213)

REPAIR PARTS LIST

ITEM NO	NO PER SET (NOTE C)	NO. PER CKT BKR	NAME OF PART	IDENTIFICATION			
				WESTINGHOUSE			STANDARD NAVY STOCK NO.
				STYLE NO.		DRAWING NO.	
81	1	1	COIL (U.V.) SEE NOTE "A"	300P233601	2.0	L-547112	
82	1	1	SPRING - TRIGGER (U.V.)	1615408	.002	22 B 7919	P425 16399-9600
83	1	1	SPRING - TRIP LEVER (U.V.)	1615407	.016	22 B 7919	P425 16339-9650
84	2	2	ARC CHUTE	1799033		32A 2915	
85	1	1	SPRING - RESET (U.V.)	1615406	.02	13 D 8370	P425-16338-2465
86	1	1	SPRING - OPER. LEVER (U.V.)	1809109	.01	52D4743	
87	1	1	RESISTOR SEE NOTE "B"				
88	1	1	CONTACT STAT. L.H. (RELAY)	1589493	.03	23A3609	P17-WX-3351

NOTE "C" - NUMBER PER SET ARE BASED ON ONE CKT. BKR PER VESSEL

NOTE "B" WARD LEONARD 3300 OHM 35 WATT RESISTOR IT.5 OF DWG. 16999 BUSHIPS TR. 81321 (VITROHM RESISTOR) (SUPPLIED AND MOUNTED ON REAR OF BKR. BASE).

NOTE A "-250V COIL FOR USE WITH RESISTOR ON 500V LINE

	VOLTG. RANGE	DUTY	DROP OUT VOLTG.
COIL ONLY	175-355 DC	CONTINUOUS	25-100 DC.
COIL + RES.	355-710 DC	CONTINUOUS	50-200 DC.
RES. ONLY	175-355 DC.	CONTINUOUS	———
RES. ONLY	355-710 DC.	INTERMITTENT	———

CERTIFICATION DATA	WESTINGHOUSE ELECTRIC CORPORATION EAST PITTSBURGH PA USA	
TYPE DBN-60S AIR CIRCUIT BREAKER	DWG. 405D213	SUB 7
GENERATOR BKR. SS 563 THRU 566 S.O. 35Y2203	BUSHIPS DWG NO	REV.
	SS563-302-1617385	D
CONTRACT NOBS-73085	SHEET 7 OF 7	

FIG. 15 — Generator Circuit Breaker Certification Data (Dwg. 405D213)

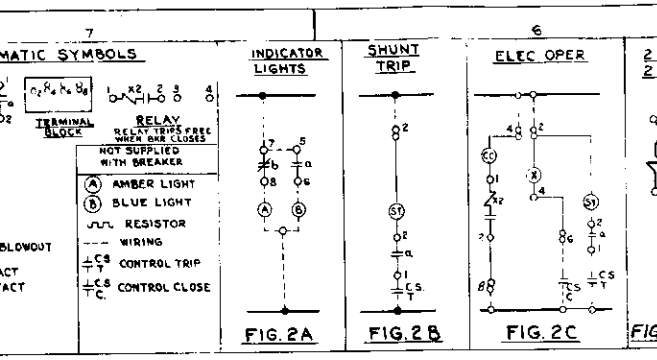


FIG. 2A

FIG. 2B

FIG. 2C

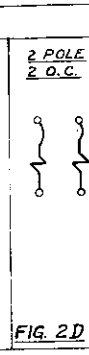


FIG. 2D

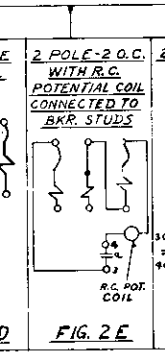


FIG. 2E

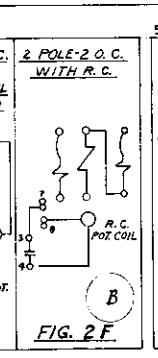


FIG. 2F

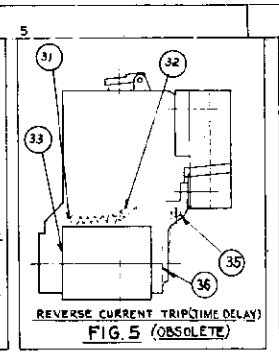


FIG. 5 (OBSOLETE)

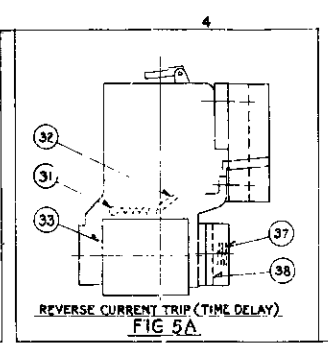


FIG 5A

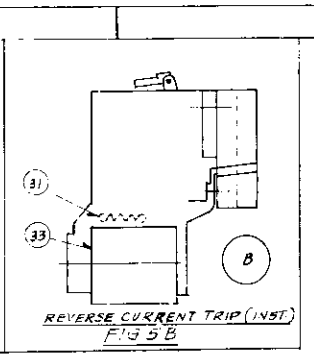


FIG 5B

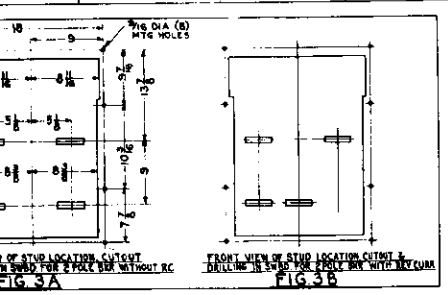


FIG 3A

FIG 3B

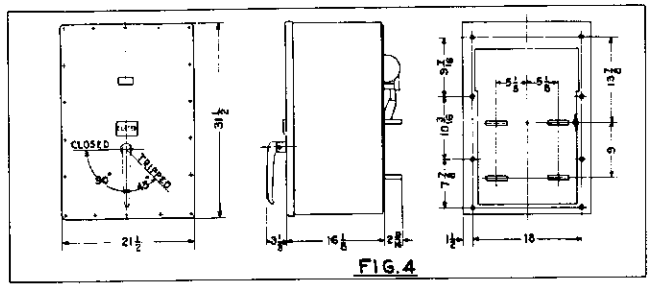


FIG. 4

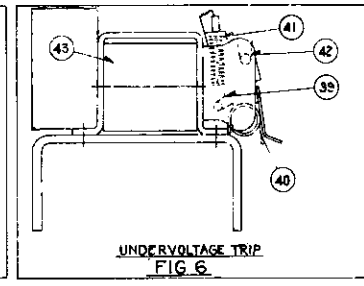


FIG 6

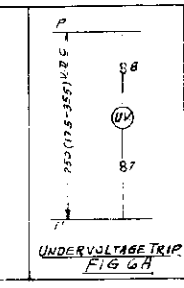


FIG 6A

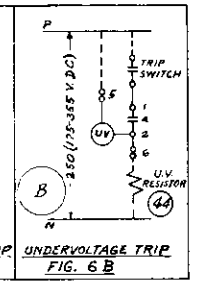
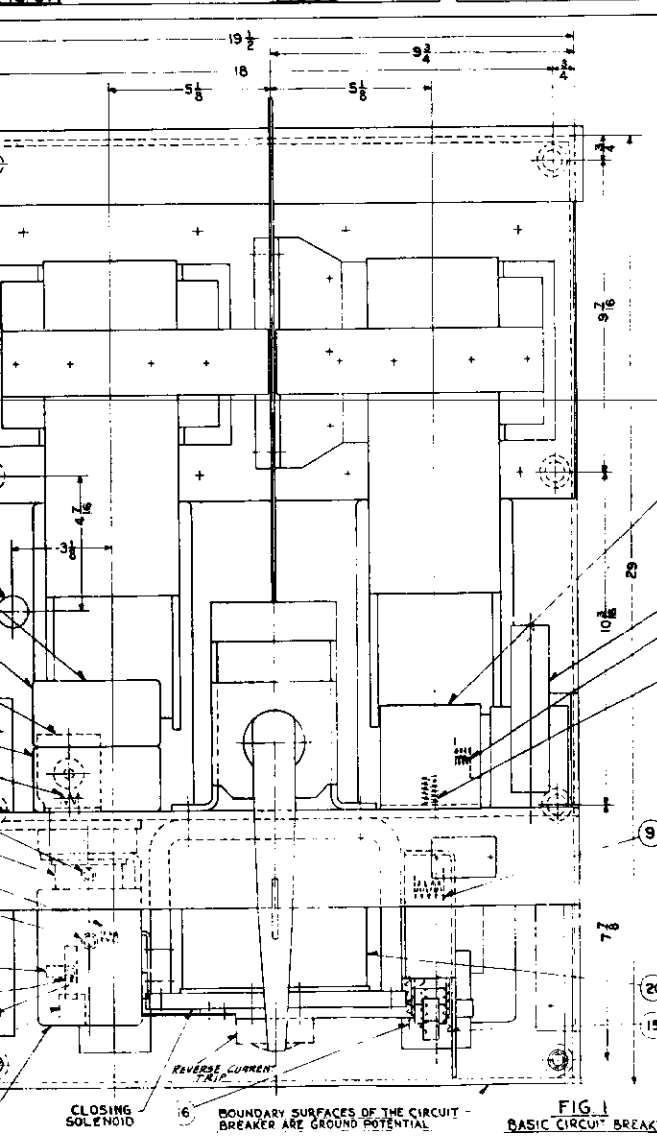


FIG. 6B



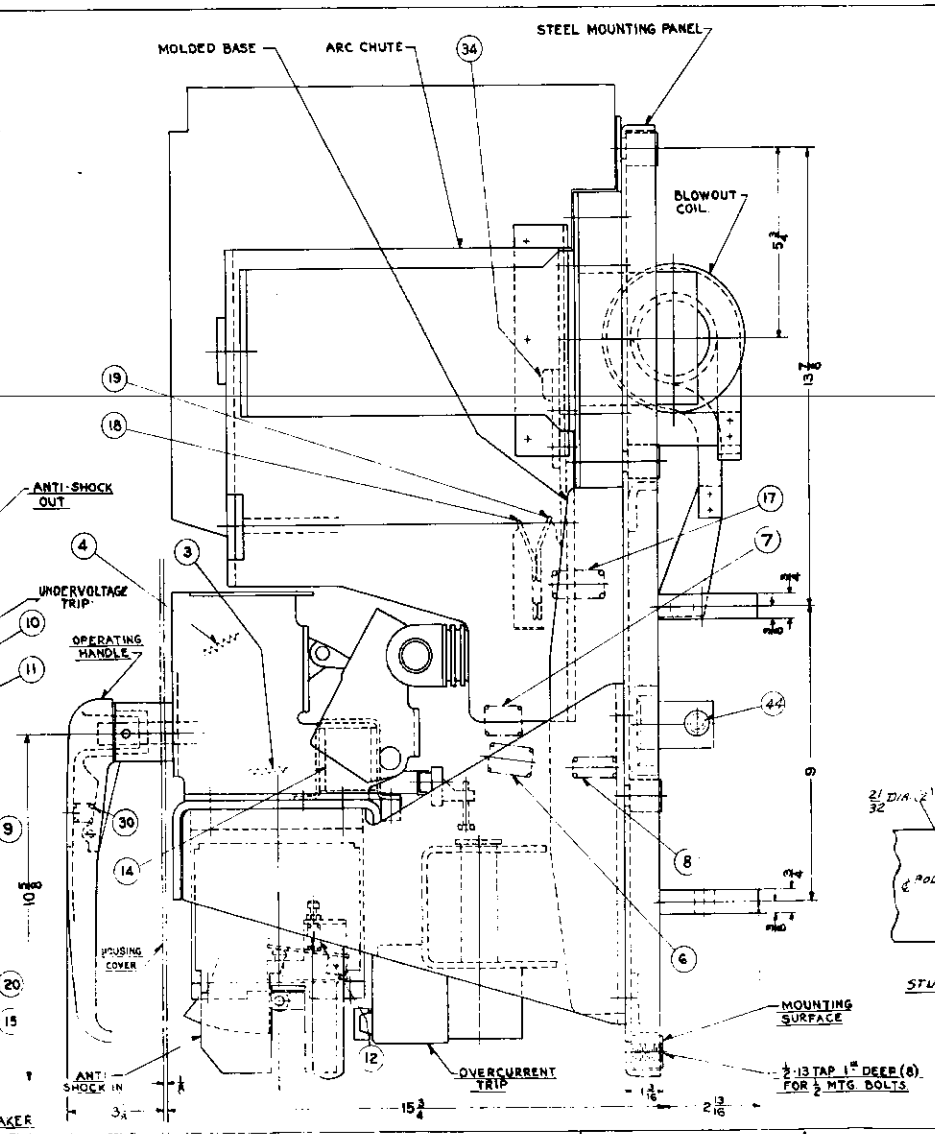
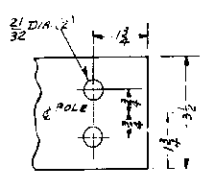


FIG. 1
BASIC CIRCUIT BREAKER



TYPICAL SPARE PARTS & TOOLS SHEET 1

PC NO	NAME OF PART OR TOOL	MFGR INFO STYLE	IT.	DWG.	STD NAVY STOCK NO
1					
2					
3	ROLLER LATCH SPRING	1584519		8-D-3981	P205-10720
4	PAWL SPRING	1581956		8-D-3981	P205-10721
5	AUXILIARY SWITCH	1581958		18-A-3635	P1WX-1983
6	ACCELERATING SPRING	1584468		18-D-6383	P205-10722
7	MAIN CONTACT SPRING	1584469		18-D-6383	P205-10723
8	BRIDGE SPRING	1584470		18-D-6383	P205-10724
9	ANTI-SHOCK IN SPRING	1611996		23-D-5209	H1WX-12888
10	ANTI-SHOCK OUT SPRING	1584521		21-D-4345	P205-10726
11	ANTI-SHOCK OUT SPRING	1584522		8-D-9236	P205-10727
12	RELAY ANTI-SHOCK TRIP SPRING	1584396		18-D-6383	P205-10728
13	SHUNT TRIP SPRING	1491282		17-D-1520	P205-10729
* 14	SHUNT TRIP COIL NOTE 1				
* 15	CALIBRATION SPRING				
* 16	SPRING (O.C. INST.)				
17	SPRING (STATIONARY ARC CONTACT)	1584471		18-D-6383	P205-10730
18	MOVING CONTACT (ARCING)	1584472		28-A-1391	P1WX-1987
19	STATIONARY CONTACT (ARCING)	1584473		22-B-1721	P1WX-1988
* 20	COIL (SOLENOID) NOTE 2				
21	ARM SPRING (RELAY)	1574432		17-D-5806	P205-10838
22	LATCH SPRING (RELAY)	1491484		17-D-5806	P205-10734
23	TRIP SPRING (RELAY)	1538822		18-D-9176	P205-10737
25	STATIONARY CONTACT (RELAY)	1491296		23-A-3609	P1WX-1990
26	MOVING CONTACT (RELAY)	1491294		23-A-3609	P1WX-1991
27	CONTACT SPRING (RELAY)	1491306		17-D-5806	P205-10738
28	BLOWOUT COIL & BKT (RELAY)	1491288		6-C-7723	P1WX-1992
* 29	COIL (RELAY) NOTE 2				
30	HANDLE STOP SPRING	1589485		21-D-7417	P1WX-2107
31	SPRING (CALIB. REV. CURR.)	1589382		18-D-9178	P1WX-2111
32	SPRING (REV CURR TIME DELAY LATCH)	1581752		21-D-7414	P1WX-2112
* 33	COIL (REV CURR) NOTE 3				
34	CONTACT (ARC-CHAMBER)	1581987		31-A-7789	P1WX-2113
35	SPRING (REV CURR. TIME DELAY)	1581781		19-B-8922	P1WX-2110
36	DIAPHRAGM (REV CURR. TIME DELAY)	1574616		19-B-8922	P1WX-2109
37	SPRING (REV CURR TIME DELAY)	1809178		31-D-6562	
38	DIAPHRAGM (REV CURR. TIME DELAY)	1909217		60-A-4971	
39	SPRING (U.V. TRIGGER)	1615408		22-B-7919	
40	SPRING (U.V. TRIP LEVER)	1615407		22-B-7910	

NOTE 1: 120 D.C. 70-140 D.C.; 240 D.C. 140-280 D.C.; 250 D.C. 175-355 D.C.
NOTE 4: 125 D.C. 88-175 D.C.; 250 D.C. 176-353 D.C.
NOTE 2: 120 D.C. 90-130 D.C.; 240 D.C. 180-260 D.C.; 250 D.C. 175-355 D.C.
NOTE 3: 2.5 D.C. 135-355 D.C.; 250 D.C. 350-710 D.C.
* AS PER CERTIFICATION DATA SHEET.
CONTD ON SHEET 2

TYPICAL SPARE PARTS & TOOLS SHEET 2

PC NO	NAME OF PART OR TOOL	MFG. INFO STYLE	IT	DWG	STD NAVY STOCK NO
B 41	SPRING (U.V. RESET)	1615406		13-D-8370	
42	SPRING (U.V. OPER LEVER)	1809109		52-D-4743	
* 43	COIL NOTE 4				
44	RESISTOR (NOTE 5)				

NOTE 5 - 35 WATT WARD LEONARD VITROHM RESISTOR PC #5 OF BUSHIPS DWG TR #1321 OR EQUIVALENT. SEE CERTIFICATION DATA FOR RESISTANCE AND NOTES INDICATING IF RESISTOR IS SUPPLIED AND/OR MOUNTED BY BREAKER MANUFACTURER

REVISIONS

REV	ZONE	DESCRIPTION	MFR DATE	MFR APPD	USN DATE	USN APPD
B		REV. "A" CHANGED TO "B" PER BUSHIPS LTR DTD 30 SEP 54 LTR 30-576/9665 SER 376 12-12 1953 - FIG 3A 3B, 4, 5, 6A, 6B, 2F AND ITEMS 37 TO 43 AND NOTES A&B WERE NOT ON. NOTE 3 WAS 300V ONLY FIG 5 WAS NOT MARKED OBSOLETE SUPERIOR BROYDEN CONNECTICUT, TR 85 ENGINEER OF SEP 1" C-7706 OF 3 A 16 1954				
C	11-A	CHANGED TO REV'C" AS PER BUSHIPS LTR 73285 (568K) 3 TR 560-38499 OF 12 APRIL 1957				

FOR BILL OF MATERIAL SEE DWG. 1-JH-229 BUSHIPS NO. TR 81504

DESCRIPTIVE DATA

MFGR	WESTINGHOUSE ELECTRIC CORP
TYPE	NAVY ACB MFGR DBN-605
VOLTAGE RATING	750 V.D.C 1 POLE - 1000 V.D.C 2 POLE
KIND OF CURRENT	D.C
FRAME SIZE	1600
CONTINUOUS CURRENT RATING (COPPER)	2600 AMPS. FOR OVERCURRENT COILS
	1750 AMPS. FOR REVERSE CURRENT COILS
INTERMITTENT CURRENT RATING	5400 AMPS FOR 1 HOUR
INTERRUPTING RATING	50000 AMPS 500 V.D.C 1 POLE IN CELL FIG 4.
	50000 AMPS. 1000 V.D.C 2 POLE IN CELL FIG 4 --- 30000 AMPS 750 V.D.C 1 POLE IN CELL FIG 4.
NO OF POLES	2
TYPE OF MOUNTING	STATIONARY - DEAD FRONT
CONNECTION	BACK
SHOCK RESISTANCE	CLASS HI
MEANS OF CLOSING	ELECTRIC OR MANUAL
PROTECTIVE FUNCTIONS	OVERCURRENT
	SHORT TIME DELAY
	INSTANTANEOUS
	REVERSE CURRENT (TIME DELAY)
ATTACHMENTS	CLOSING SOLENOID & RELAY
	SHUNT TRIP
	AUXILIARY SWITCH
AMBIENT TEMPERATURE	50° C
TEST RECORD PLAN NO	1-JH-229 BU. SHIPS NO. TR-81504
SHOCK TEST DATA	SEE GENERAL NOTE "B"
NAVY DEPT. SPEC	SEE GENERAL NOTE "A"
EXCEPTIONS TO SPEC	SPECIAL SPECIFICATIONS FOR MACHINERY FOR SUBMARINES 55565-568

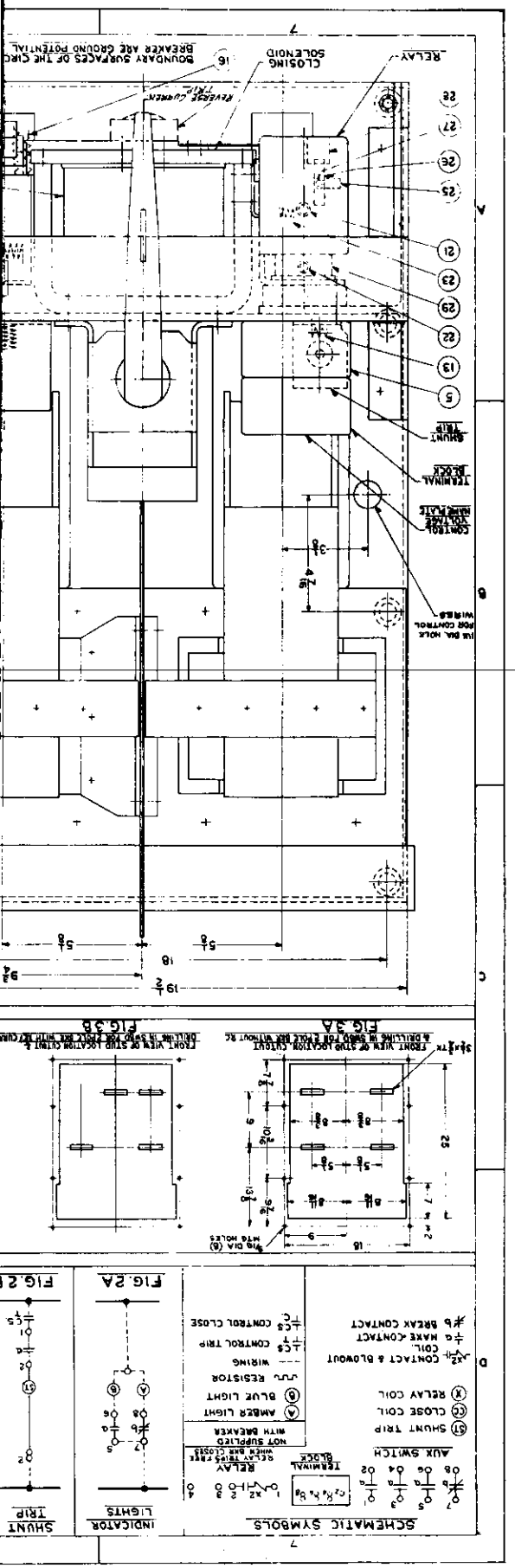
WEIGHT OF ATTACHMENTS		WEIGHT OF BASIC BREAKERS	
CLOSING SOLENOID & RELAY	58 LBS	2 POLE-2 TRIP COILS	317 LBS.
SHUNT TRIP	1½ LBS	2 POLE-2 TRIP COILS-R.C.	367 LBS
AUXILIARY SWITCH	¾ LBS		
ENCLOSURE - FIG. 4	125 LBS		

GENERAL NOTES

A - THIS EQUIPMENT WAS DEVELOPED UNDER MILITARY SPECIFICATION 17B1. IT ALSO MEETS THE REQUIREMENTS OF MILITARY SPECIFICATION MIL-C-15960 EXCEPT: CLOSING SWITCHES MUST BE MOMENTARY CONTACT TYPE SINCE CLOSING RELAY IS RATED FOR MOMENTARY DUTY

B - SHOCK TEST DATA AVAILABLE IN MATERIAL LABORATORY (NY. NAVAL SHIPYARD) TECHNICAL REPORT ON LAB. PROJECT 5179-3 FINAL REPORT NSC 676-021 OF 11 SEPT. 1952

DFTM THOMSEN 11-6-50	MASTER PLAN	WESTINGHOUSE ELECTRIC CORP EAST PITTSBURGH, PA
APPD J. Thomsen	AIR CIRCUIT BREAKER W.E. CORP. TYPE DBN-605 NAVY TYPE-ACB	1-JH-220 SU1
APPD J. W. Finney		NAVY DEPT. BU SHIPS
APPROVAL 11-6-50		BU SHIPS NO. 56202-3,102,132 REV. C
C.F.E. NAVY 11-6-50		
7-30-54	STD NAVY STOCK NO.	SHEET 1 OF 1 SHEET
APPROVAL 11-6-50	SCALE 1/2 UNIT WT.	


SCHEMATIC SYMBOLS
AUX SWITCH
SHUNT TRIP
CLOSE COIL
RELAY COIL
CONTACT & BLOWOUT COIL
MAKE CONTACT
BREAK CONTACT
BLUE LIGHT
AMBER LIGHT
WITH BREAKER
WIRING
RESISTOR
CONTROL TRIP
CONTROL CLOSE
TERMINAL BLOCKS
RELAY
NOT SUPPLIED
INDICATOR LIGHTS
SHUNT TRIP
FIG. 2A
FIG. 3A
FIG. 3B
CLOSING SOLENOID
RELAY
SHUNT TRIP
TERMINAL BLOCKS
CONTROL VOLTAGE FUSE PLATE
TIE BAR HOLE FOR CONTROL WIRES